
THE CENTRAL MEDITERRANEAN NATURALIST



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THE CENTRAL MEDITERRANEAN NATURALIST

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In 1998, three N.G.O.s sharing the common aim of promoting the awareness, conservation and study of Malta's natural heritage decided to join forces so as to form a single, more effective association. The organizations were the Society for the Study and Conservation of Nature (SSCN), founded in 1962, and the more recently formed groups Arbor and Verde.

This merger resulted in the formation of Nature Trust (Malta) which was officially launched by His Excellency the President of the Republic on Friday 8th January 1999. In June 2001, another organization, the Marine Life Care Group (MLCG) also joined Nature Trust (Malta).

Mission Statement

'Committed to the conservation of Maltese nature by promoting environmental awareness, managing areas of natural and scientific interest, and lobbying for effective environmental legislation.'

EDITOR: Dr. Alan Deidun

EDITORIAL BOARD: Ms. Jennifer Fiorentino, Dr. Paul Gatt, Mr. Titian Schembri

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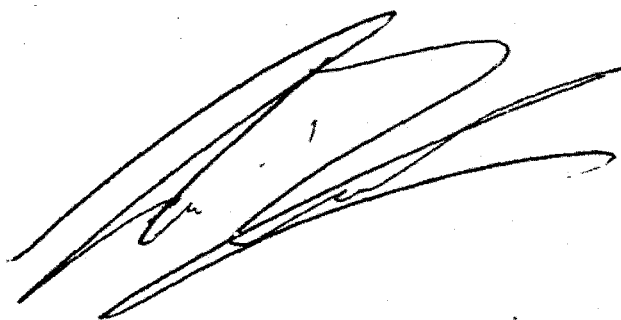
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EDITOR'S NOTE

The current issue of The Central Mediterranean Naturalist is a bumper issue indeed, with a total of twelve submitted and refereed works being incorporated in such an issue. This bonanza in scientific works addressing various aspects of the local natural heritage is symptomatic of a current resurgence in interest in such heritage, also denominated by a healthy crop of budding local naturalists, besides an unremitting interest in the local natural heritage by foreign-based naturalists too.

The legacy of The Central Mediterranean Naturalist is compelling indeed. The journal traces its origins in The Maltese Naturalist, way back in 1970 and, together with another journal, Potamon, constitutes a veritable treasure trove of information and records on various aspects of the local natural heritage. A paper included within the current issue traces back and lists the voluminous contents of the three journals to facilitate their future retrieval and cross-referencing by co-workers. Yet again this year, the full contents of the journal will be digitized and these will be available for retrieval over the internet, besides being listed in selected scientific citation systems.

The editorial board of The Central Mediterranean Naturalist and Nature Trust (Malta) are indebted to the Environment Protection Directorate (EPD) of The Malta Environment and Planning Authority for yet again concretizing its commitment to the continued publication of the journal, and thus spearheading research on the frequently overlooked local natural heritage. The board is also indebted to the authors of the works contained within the current journal issue, for their tireless and dedicated work towards the promulgation of knowledge on such heritage and to the paper referees/reviewers in the various disciplines, for scrupulously and diligently safeguarding the rigorous high scientific standard set by the journal.

A handwritten signature in black ink, appearing to be 'Alan Deidun', with a large, sweeping flourish extending from the end of the name.

Dr. Alan Deidun
Editor

FOREWORD

For the second consecutive year, we are very pleased to be able to collaborate with Nature Trust (Malta) on the publication of this journal. It is a satisfaction for us to introduce the publication of this new issue of the Central Mediterranean Naturalist, noting its importance as one of the main scientific peer-reviewed journals in Malta.

This years' edition clearly shows the interest of the Maltese scientific community on Maltese biodiversity, particularly on the Maltese flora and entomofauna, in line with the tradition established since the inception of the Central Mediterranean Naturalist, and its precursor, The Maltese Naturalist. It is reassuring to know that with the ever-increasing knowledge on threats to biodiversity and our well-being, Maltese and foreign scientists carry out surveys and research to assess the status of Maltese flora and fauna and their distribution, since we as policy-makers and implementers depend on such information in their formulation of strategies, guidelines and policies.

Through this engagement with experts from the scientific research community and non-governmental organisations, we can certainly identify better the gaps associated with a number of cross-cutting biodiversity themes, and perhaps develop similar research on high profile areas, such as:

- the assessment of the conservation status of Maltese and Mediterranean habitats and biota;
- the conservation of genetic diversity;
- the impact of non-native invasive species;
- the impact of climate change on the environment (and the adaptation of local biota to this); and
- the importance of new technology for the direct and indirect conservation and sustainable use of biological resources.

These are all areas where we should strive and invest more in the near future. In this respect, MEPA will always strive to promote national and international research and scientific co-operation in the field of conservation and sustainable use of biological diversity, where possible, more so when such research and scientific work falls within the objectives and provisions of the Flora, Fauna and Natural Habitats Protection Regulations, 2006 (Legal Notice 311 of 2006).

Of course, we augur all success to Maltese researchers, and encourage them to continue working on such biodiversity issues, and related issues. We hope that through this publication, and the open dialogue with the Nature Trust (Malta) and the scientific community, we will be able to develop a sound National Biodiversity Strategy and Action Plan for the Maltese Islands, and we are sure that such research is already a step in the right direction.

Martin Seychell
Director of Environment
Environment Protection Directorate
Malta Environment & Planning Authority

FIRST RECORD OF *PYRENOCOLLEMA HALODYTES* (NYL.) R. HARRIS (PYRENULALES: PYRENULACEAE) FROM THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

Jennifer FIORENTINO¹

ABSTRACT

The marine crustose lichen *Pyrenocollema halodytes* (Nyl.) R. Harris is known to grow on substrates such as limestone, chalk, molluscan shells and barnacles and is consequently considered as a marine lichen. It was formerly placed under the genus *Arthopyrenia* but together with other lichens from this genus all containing cyanobacteria as the symbiont photobiont was placed under the genus *Pyrenocollema*. In this review *Pyrenocollema halodytes* is being recorded for the first time from the Maltese Islands having been found growing at Mistra Bay on the calcareous plates of the Star Barnacle *Chthamalus stellatus* found on rocks of the upper mediolittoral zone.

Keywords: barnacle, cyanobacteria, crustose marine lichen, Maltese Islands, perithecium

INTRODUCTION

The genus *Pyrenocollema* consists of crustose immersed or superficial lichens with cyanobacterial photobionts. The fruiting bodies of lichens of this genus consist of melanised perithecia bearing colourless 1-sepate spores. These lichens may be found growing on calcareous substrates in moist habitats, on wet sand, or on acid rocks in freshwater or marine habitats (Purvis *et al*, 1992). *Pyrenocollema halodytes* (Nyl.) R. Harris is one of the few lichens which can withstand partial submersion in salt water (Nimis, 1993) and consequently can be described as marine. It is a subcosmopolitan lichen and has been reported from a number of regions including the North American and Canadian coasts (Esslinger, 1997), the Californian Pacific coast (Tucker & Jordan, 1979) and along the coast of the British Isles (Purvis *et al*, 1992). *P. halodytes* has also been reported in different parts of the Mediterranean including the North East coast of Spain (Llop and Hladun, 2003) and along various parts of the Italian coast including Calabria (Puntillo, 1996) and Sicily (Nimis and Martellos, 2008).

The lichen has never been reported from the Maltese Islands which is surprising considering that it is considered common in dry, mediterranean Italy (Nimis and Martellos, 2008). The lichen checklist of Sommer and Caruana Gatto (1915) does not include any of the formerly used synonyms of this lichen e.g. *Arthopyrenia halodytes* (Nyl.) Am. It is also not to be found in the well-conserved lichen collection at the Natural History Museum in Mdina. Consequently with all this in mind different substrates including limpets, barnacles and gastropods from the mediolittoral zone along the coast of the Maltese Islands were examined for the presence of this lichen.

Pyrenocollema halodytes was finally localised on the plates of the Star Barnacle *Chthamalus stellatus* which was growing in great numbers on the upper mediolittoral zone in a rocky beach at Mistra Bay (Figure 1). This is the first record of *Pyrenocollema halodytes* (Nyl.) R. Harris from the Maltese Islands.

¹ Department of Biology, University Junior College, Msida, Malta email: jennifer.fiorentino@um.edu.mt



Figure 1. Population of Star Barnacles: *Chthamalus stellatus*

MATERIALS & METHODS

A number of barnacles of species *Chthamalus stellatus* of different sizes were collected. The calcareous plates of these sessile crustaceans were examined with a stereomicroscope at X20 and X40. A compound microscope was used to examine sections of perithecia, asci and spores at X100 and X400.

Morphology: No thallus observed on the plates - thallus endolithic. Fruiting bodies (ascmata) in the form of black perithecia between 0.2mm to 0.35mm in diameter. Some perithecia protruding from the surface of the plate, others immersed. Ostioles were up to 50 μ m in diameter (Figures 2 and 3).

Anatomy: Vertical sections of perithecia mounted in water and observed using a compound microscope. Distinct, black involucrellum, often hemispherical, of between 250-315 μ m diameter and around 40-60 μ m thick (Figure 4). Pale brown excipulum. Paraphyses not separate but forming a branched network.

Asci varying in shape, pyriform to ovoid 50-70 x 15-25 μ m, dimidiate. (Figures 5 and 6). Eight spores in each ascus. Spores 19.5-24 x 8-10.5 μ m, clavate-ovoid, colourless, 1-septate, one cell slightly wider than the other (Figure 7). Tissue from beneath perithecia showed chains of cyanobacterial cells of up to 10 μ m width (Figure 8).

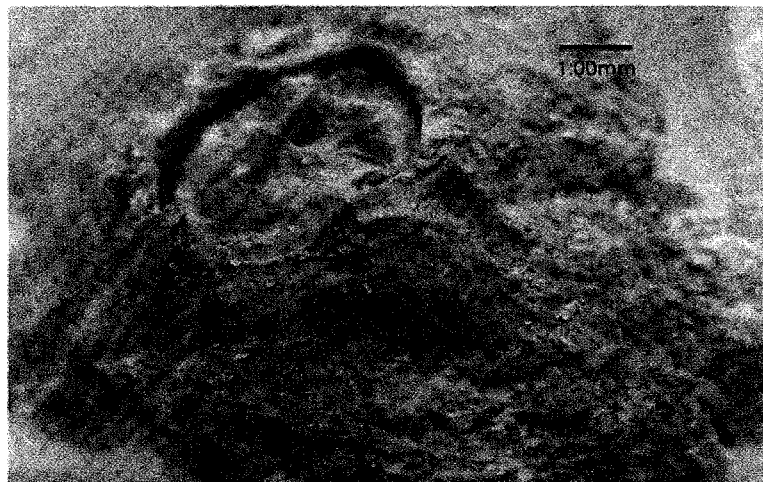


Figure 2. Two perithecia (*arrowed*) on barnacle plates

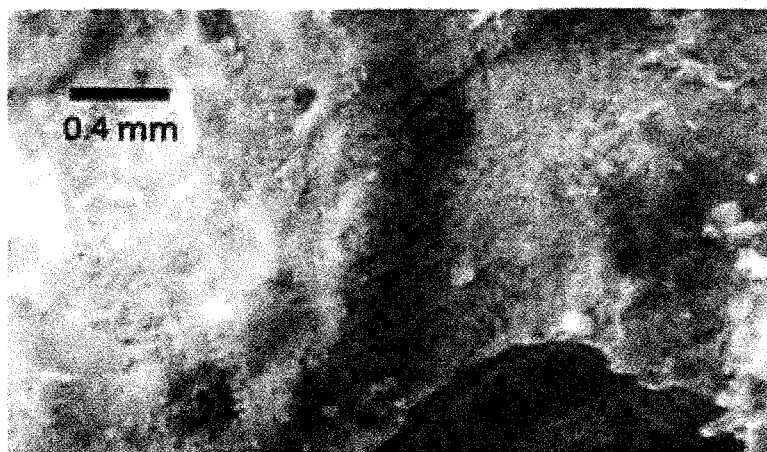


Figure 3. Close up of 2 perithecia with their ostiole

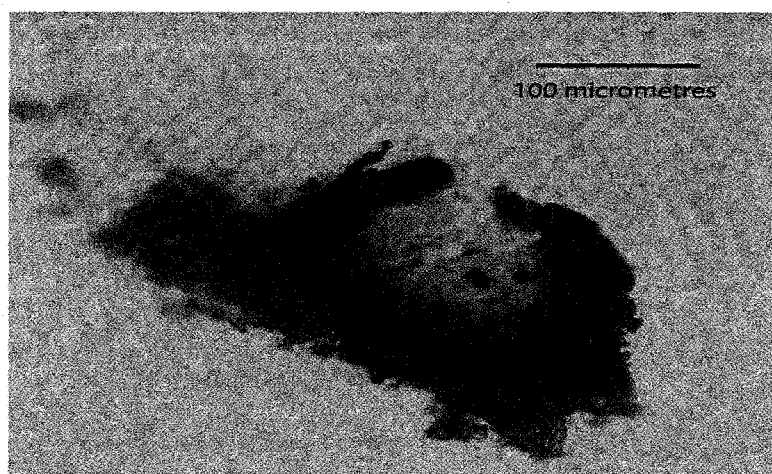


Figure. 4. Perithecium in section showing involucrellum

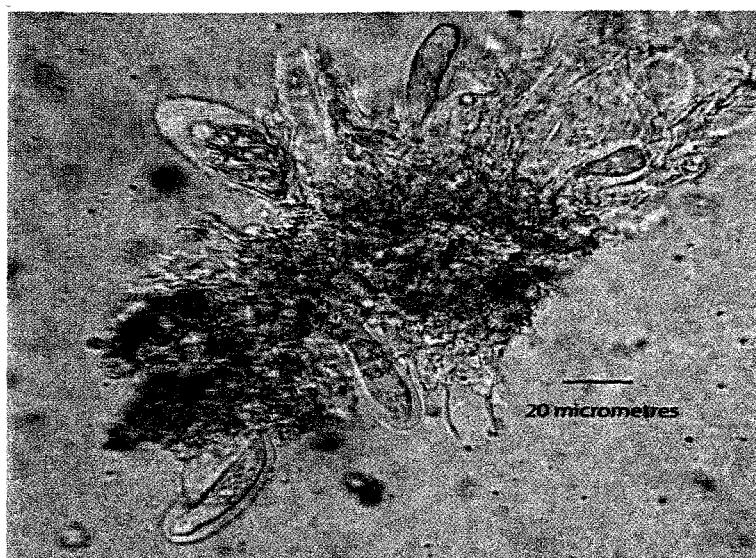


Figure 5. Cluster of asci of *Pyrenocollema halodytes*



Figure 6. Asci of *Pyrenocollema halodytes* with spores

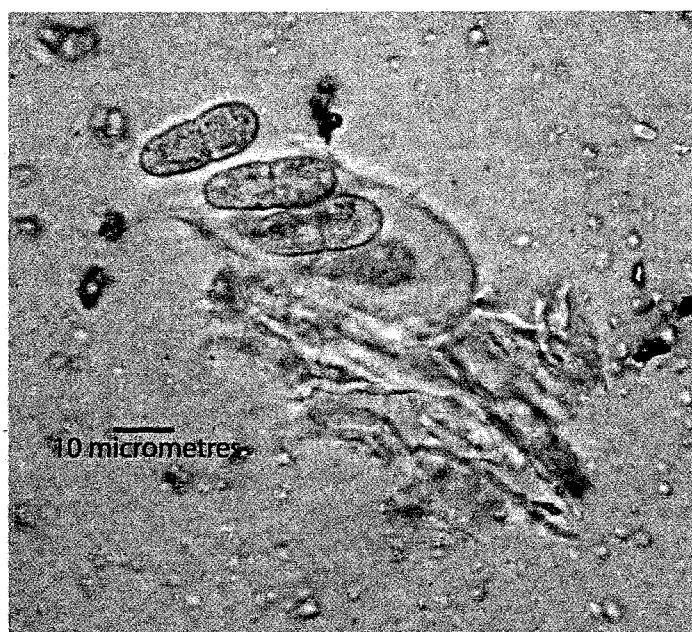


Figure 7. Spores of *Pyrenocollema halodytes*

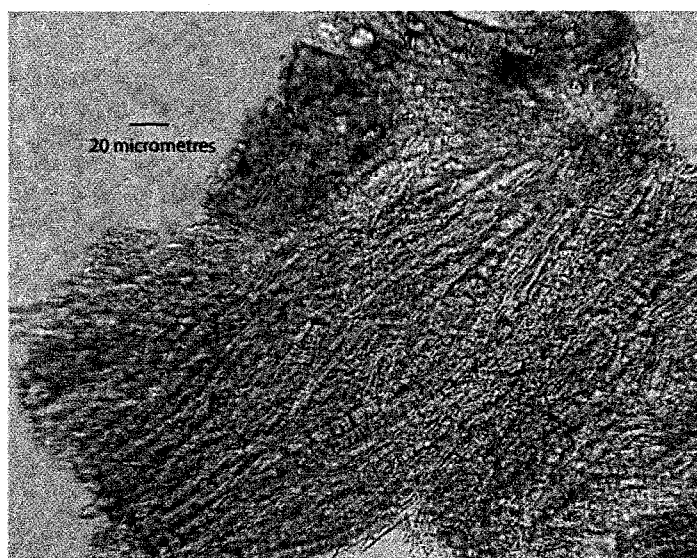


Figure 8. Chains of cyanobacterial cells from beneath a perithecium of *P. halodytes*

DISCUSSION AND CONCLUSION

The genus *Pyrenocollema* was coined in order to group some saxicolous members of the genus *Arthopyrenia* having cyanobacteria as photobionts. A thorough description of *Pyrenocollema halodytes* (Nyl.) R. Harris is given by Swinscow (1965) where he refers to the lichen with its former synonym *Arthopyrenia halodytes* (Nyl.) Arnold. According to Swinscow the thallus of this lichen tends to be immersed in the substratum and not evident if growing

on calcareous shells. This is in agreement with the morphology of the lichen discovered on barnacles at Mistra and described above.

Swinscow (1965) reports perithecia as being from almost sessile to almost wholly immersed with ostiole width varying between 20-100 µm, presence of a black, hemispherical to flattened conical involucrellum 150 - 500 µm in diameter and of a colourless to pale brown excipulum usually about 100-150 µm in diameter. Asci are quoted as being 50-80 x 15-20 µm and spores as being septate, colourless, fusiform-ovate, 12-20 x 5-10 µm with upper cell wider than the other. Clauzade & Roux (1985) and Purvis et al (1992) also give similar observations. These measurements are in agreement with what I observed for my specimen.

The photobionts of lichens belonging to the genus *Pyrenocollema* are cyanobacteria (*Gloeocapsa*, *Hyella* or *Nostoc*) (Purvis et al., 1992). Swinscow (1965) cites the cyanobacterium of *P. halodytes* as being *Hyella caespitosa* Bornet & Flahault often growing in chains of pale yellowish-brown, irregularly elongate to sub-spherical cells, 3-10(-12) µm in diameter. The photobiont cells are arranged loosely and in irregular clumps when the thallus is on a calcareous substratum (Swinscow, 1965). Although no sections of the thallus were made, tissue collected from beneath perithecia did reveal the presence of cyanobacterial filaments of an orange-brown colour similar to *Hyella caespitosa* (Figure 8). The cells were found to be up to 10 µm in diameter. However, as barnacles are always exposed to sea water it is difficult to determine whether these cyanobacteria are actually symbiotic photobionts of *P. halodytes* or simply adventitious cyanobacteria happening to be growing beneath the surface of the barnacle plates.

Hence, based on its marine habitat, general morphology, presence of an involucrellum and excipulum, size and form of spores one can conclude that the lichen found growing on barnacles of the upper mediolittoral zone is *Pyrenocollema halodytes* (Nyl.) R. Harris. This is the first record of this lichen from the Maltese Islands.

ACKNOWLEDGEMENTS

I wish to thank Prof. P.J. Schembri (Department of Biology, University of Malta) for providing me with an identification key for local barnacles which I used to identify *Chthamalus stellatus*. I also appreciate the help of Domenico Puntillo (Museo di Storia Naturale della Calabria ed Orto Botanico, Università della Calabria) for confirming *Hyella caespitosa* as the photobiont of *Pyrenocollema halodytes* before I could access Swinscow (1965).

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A FURTHER TWO SPECIES OF SNAIL-KILLING FLIES (DIPTERA: SCIOMYZIDAE) FROM THE MALTESE ISLANDS

Paul GATT¹ & Martin J. EBEJER²

ABSTRACT

The family Sciomyzidae (Diptera) was previously known in the Maltese islands from two specimens of *Pherbellia cinerella* (Fallén, 1820) recorded in 1995. Two other species – *Pherbellia mikiana* (Hendel, 1900) and *Hydromya dorsalis* (Fabricius, 1775) – are added to the Maltese fauna, and notes on their biology and distribution are provided.

Keywords: Malta, Diptera, Sciomyzidae, new records.

INTRODUCTION

The Sciomyzidae (Diptera: Brachycera) is a family of some 140 Western Palaearctic and Mediterranean species whose larvae are predatory on molluscs. Most species are aquatic or semiaquatic, but some are fully terrestrial. Adult flies are mostly found resting on vegetation near water. The Mediterranean fauna has been monographed by Vala (1989) for France and Southern Europe and Rivosecchi (1992) for Italy and its islands.

The family was first discovered in Malta by Ebejer (1995) who recorded *Pherbellia cinerella* (Fallén, 1820) and speculated that other widespread species of the family may eventually be discovered. The purpose of this article is to present a further record of *P. cinerella* and to record two other species of the family, *Pherbellia mikiana* (Hendel, 1900) and *Hydromya dorsalis* (Fabricius, 1775) which were hitherto unknown from the islands, and provide notes on their biology and distribution.

MATERIALS & METHODS

The records on which this article is based are of adult flies which have been sweep-netted by the authors, and which are preserved in their private collections.

¹ 56, Godwin Ganado Street, Tal-Virtu, Rabat RBT 2642, Malta. E-mail: paulgatt@onvol.net (corresponding author)

² Hendre, Maes-y-Bryn, Colwinston, Cowbridge, CF71 7NL, United Kingdom. Email: martin.ebejer@btinternet.com

RESULTS

Hydromya dorsalis (Fabricius, 1775)

Material examined: GOZO: 1£, Dwejra, Qattara, 22.IV.2006, swept from vegetation around freshwater pond, P. Gatt.

Distribution: A widely distributed Palaearctic species. New record for Malta where, so far, it is known only from Gozo.

Notes: the larvae of this species are predatory on a wide variety of aquatic molluscs and their eggs. Early instars are also scavengers of dead snails. They preferentially develop in moving bodies of fresh water.

Pherbellia cinerella (Fallén, 1820)

Material examined: MALTA: 1£, Wied il-Ghasel, 28.III.1997, M. J. Ebejer.

Distribution: a common and widely distributed Palaearctic species.

Notes: this species was previously recorded by Ebejer (1995) who in 1992 collected two specimens from Fawwara and Ghadira. The larvae prey on a wide variety of terrestrial and aquatic molluscs. An ecologically versatile species which thrives in both dry and humid biotopes.

Pherbellia mikiana (Hendel, 1900)

Material examined: MALTA: 2££, Salina, 22.IV.1994, P. Gatt; 1\$, Mgiebah, 28.V.1994, M. J. Ebejer; 1£, Mgiebah, 26.III.1995, M. J. Ebejer; 1£, Mgiebah, 23.II.1997, M. J. Ebejer; 2££, Salina, 10.I.1999, M. J. Ebejer; 1£, Gnejna, 23.XII.1999, M. J. Ebejer; 7££ & 2\$\$, Salina, 28.X.2001, M. J. Ebejer.

Distribution: *P. mikiana* is a rare species and until now was only known from France, Italy (Tuscany, Isle of Elba and Venice,) Croatia and Greece. One of us (MJE) has also collected 4££ and 1\$ 6kms east of Zygi, Cyprus (new record). Thus these records from Malta and Cyprus are an important addition to the known distribution of this species.

Notes: The biology of this species is unknown. All records are from coastal localities and within about 10 metres of the shoreline. Previous records are also from littoral sites, but Vala (1989) includes an altitude of 600 m without further clarification. The habitats on Malta where *P. mikiana* was collected were similar. All had variable quantities of *Posidonia* wrack as well as bare rock and were close to a trickle of fresh water. The dominant flowering plant was *Inula crithmoides* Linnaeus. Snails were plentiful and many species were represented. The sample from Salina (28.X.2001) was kept alive and mating was observed, but no oviposition took place. However, on Cyprus the fly was taken from the shoreline itself, which consisted of coarse sand with very little beached wrack. A few *Tamarix* trees and a small stand of *Phragmites* were growing just a little further inland at this site near a small stream. No note of snails was made.

DISCUSSION

Despite their small size and limited habitat diversity, the Maltese islands host a large number of terrestrial and freshwater mollusc species, some of which reach very high population densities (Schembri, 2003). The most recent monograph by Giusti *et al.* (1995) lists 70 species, eight of which are more or less of recent human introduction (Schembri, 2003).

It is therefore rather surprising that only three, seldom-collected species of Sciomyzidae are known from the islands. By contrast, 29 species in this family have been recorded from Sicily and 11 from Cyprus (Rozkošný & Knutson, 2004). Two of the species from Malta - *P. cinerella* and *H. dorsalis* - are common, widespread Palaearctic species with a wide variety of hosts. The third, *P. mikiana*, is a rare Mediterranean coastal species of unknown biology.

Although the family was only recently discovered in Malta it is more likely that these flies had been previously overlooked rather than being of recent introduction to the islands.

ACKNOWLEDGEMENTS

Thanks are due to Prof. P. J. Schembri (Department of Biology, University of Malta) for useful information on the land and freshwater molluscs of Malta.

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REDISCOVERY OF *EROPHILA VERNA* (L.) CHEVALLIER (BRASSICACEAE), *PTERIDIUM AQUILINUM* (L.) KUHN (DENNSTAEDTIACEAE), AND *CRATAEGUS AZAROLUS* L. (ROSACEAE) ON THE ISLAND OF MALTA (CENTRAL MEDITERRANEAN).

Sdravko Vesselinov LALOV¹ and Edwin LANFRANCO²

ABSTRACT

The rediscovery of *Erophila verna*, *Crataegus azarolus* and *Pteridium aquilinum* on the island of Malta is reported reconfirming the presence of these species in the Maltese islands after they had not been seen for many years.

Keywords: *Erophila verna*, *Pteridium aquilinum*, *Crataegus azarolus*, Maltese Islands, Flora

Erophila verna

Erophila verna (L.) Chevallier, the common Nail-Wort, is found throughout Europe except the arctic, northwards to 66° in Norway (Tutin *et al.* 1964) as well as in most warm and temperate areas of Asia and in the entire Mediterranean. The species is naturalized in North America. It grows on disturbed ground, in sparsely vegetated grasslands, in fields, along paths and on walls, usually in dry, loose, humose, quite nitrogen rich soils, on clay, sand or gravel in association with other small annuals. The aggregate *E. verna* has been divided into numerous species, subspecies, races and forms by various authors. Since self-pollination is normal in *E. verna* those varieties are quite stable and some occur throughout the entire range of the species (Hegi 1963). The plant was first described as *Draba verna* by Linnaeus, than moved into a separate genus *Erophila* by Chevallier. Recent molecular studies (Koch & Al-Shehbaz 2002) suggest that the genus *Erophila* has to be transferred back into *Draba*.

In the Maltese islands *Erophila verna* has been historically recorded from Malta, Gozo and Cominotto. In Gozo Gulia (1875) records it as '*Draba verna* Lin. = *Erophila vulgaris* D.C.' from limestone hills without giving any specific location. The record of *Erophila verna* var. *Krockeri* from ledges on the cliffs of Cominotto (Duthie 1874) results probably from a confusion with *Hutchinsia procumbens* L. (Sommier & Caruana Gatto 1915). On the island of Malta the species is recorded from Hagar Qim, Wied Babu and Wied Dalam by Duthie (1874). Sommier & Caruana Gatto (1915) describe it under the name *Draba verna* L. as 'non comune' and record it from Il Hauli, Imghriet, Wied Babu, Hagar Qim and Wied Dalam. In the Argotti Herbarium some specimens collected from Hagar Qim in February 1917 are preserved. Borg (1927) records it under the name of *Draba verna* L. from Casal Luca, Nghieret, near Addolorata Cemetery, Wied Babu, Hagar Qim and Wied Dalam.

However, no records of the species exist from the last 79 years. Lanfranco, G. (1969) describes *Erophila verna* as growing in E. and S.E. Malta but he never saw the species himself (G. Lanfranco, personal communication). It is included in a list of 'Plants which have not been recorded for a considerable time and may be presumed to be

¹ Sauerbruchstr. 22, 67063 Ludwigshafen/Rh. Germany. Email: anwoda@pol.net (corresponding author)

² Department of Biology, University of Malta, Msida MSD 06, Malta. edwinlanfranco@gmail.com

extinct or on the verge of extinction' (Lanfranco, E. 1976). Haslam *et al.* (1977) cite only the old records for the species. Lanfranco, E. (1989) lists it as not been recorded for several decades.



Figure 1. Stunted specimen of *Erophila verna* with old Maltese 1 c. coin for scale. Wied ta'Kandia

In February 2006 a population of roughly 80 individuals of *Erophila verna* was encountered by one of the authors (SVL) at the bottom of Wied ta' Kandia E of Zebbug (Malta). The plants grew among flat Globigerina rocks in pockets of soil covered with moss. Some other accompanying species were *Oxalis pes-caprae* L., *Hypochoeris achyrophorus* L., *Asphodelus aestivus* Brotero, *Sedum caespitosum* (Cavanilles) DC, *Teucrium flavum* L., *Asparagus aphyllus* L., *Hyparrhenia hirta* (L.) Stapf, *Teucrium fruticans* L., *Pistacia lentiseus* L., *Urginea pancration* (Steinheil) Philippe, *Briza maxima* L., *Asperula aristata* L. f. ssp. *scabra* (J.&C. Presl.) Nyman, *Lonicera implexa* Aiton, *Phagnalon graecum* Boissier & Heldreich ssp. *ginzbergeri* Pignatti, *Lagurus ovatus* L., *Centaureum erythrea* Rafn., *Scarbiosa maritima* L. and *Rostraria cristata* (L.) Tzvelev. Throughout the area wild rabbit (*Oryctolagus cuniculus* L.) droppings and traces of burrowing were observed. Although some individuals of *Erophila verna* were destroyed by this disturbance the species seems to occur in larger numbers on the disturbed ground created by the rabbits.

In March 2007 only 12 specimens were encountered in the same location. While most *Erophila* individuals measured between 8 and 10 cm in 2006 the maximum size of the plants in 2007 was 4 cm due to the extremely dry and warm winter.

The new population is well inside the historically recorded range of *E. verna* in Malta. Because of the remote location a recent reintroduction of the species can be excluded, it seems more probable that the plants have been overlooked due to their small size and inconspicuous flowers. A survey of the locations where *E. verna* has been previously recorded might reveal that some of those populations are still in existence.

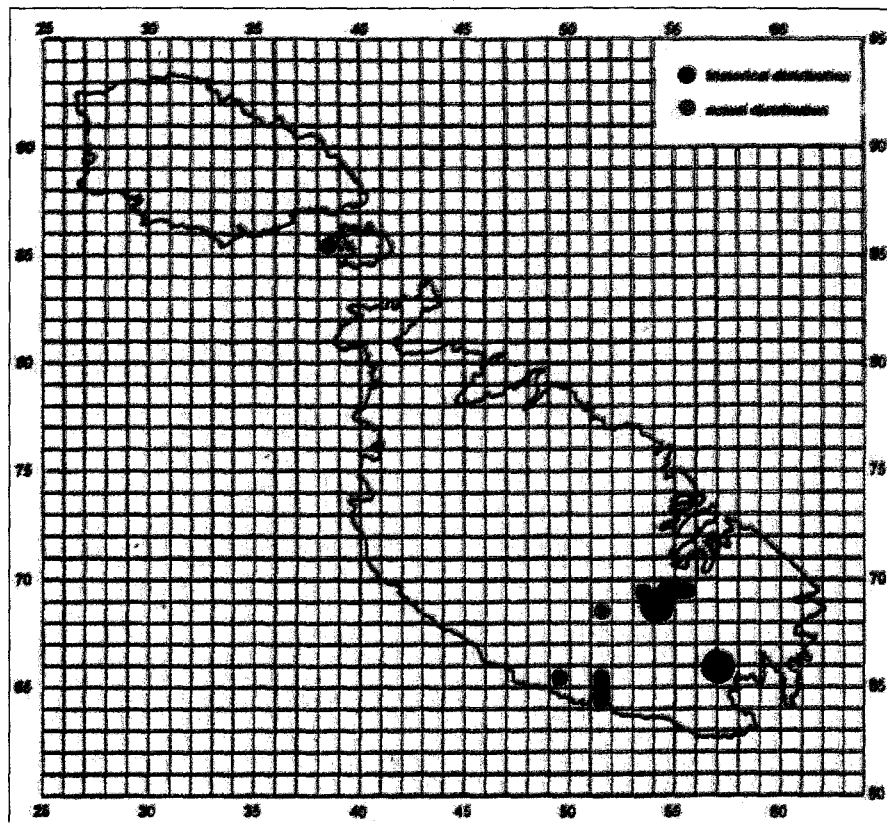


Figure 2. Distribution of *Erophila verna* in the Maltese islands (UTM, zone 33S, 1 km x 1 km grid)

Pteridium aquilinum

Pteridium aquilinum (L.) Kuhn, the bracken, is a cosmopolitan species (Tutin *et al.* 1964) which is absent only from temperate South America and from polar, desert and steppe regions (Fiori 1969). In southern Europe it grows mainly in mountain areas (Tutin *et al.* 1964), usually on humose, often acidic clayey or sandy soils poor in lime (Sebald *et al.* 1993). While the species is present in shady and protected places in forests of Sicily (Tornabene 1887) it seems to be absent from the Pelagic islands and Pantelleria (Sommier 1908). Over 100 varieties of *P. aquilinum* have been described worldwide but according to Dostàl in Sebald *et al.* (1993) only the ssp. *aquilinum* (L.) Kuhn occurs in Europe.

In the Maltese islands *P. aquilinum* is mentioned for the first time from San Blas in Gozo by Gulia (1874). Caruana Gatto (1893) and Gulia fil. (1909) record it from Rdum il-Kbir in Gozo. Sommier & Caruana-Gatto (1915) record the species from Rdum il-Kbir and San Blas and mention that it is being persecuted by the farmers because it tends to invade and take over their fields. A certain confusion arises from the use of the name "Rdum il-Kbir" (the big scree) since in different maps this toponym is being used both for the clay slopes west of San Blas and for the clay slopes and boulder screes east of San Blas. The last published records for those locations are by Borg (1927) but around 1970 old farmers in the area still remembered the plant (EL).

In Malta *P. aquilinum* appeared in a private garden at Sliema in 1976 while in 1990, also at Sliema, it appeared on a demolition site where there is now the Plaza shopping centre (EL). In both cases it is highly unlikely that those populations resulted from native stock but rather through accidental introduction. During the last decade it also appeared in a glasshouse at the Government Experimental Farm at Ghamieri (Joseph Borg in personal communication with Darrin T. Stevens).

In February 2006 the species was found by SVL in a private orchard at Gnien il-Far in the Buskett valley. This population consisted of a dense leaf cluster less than 2 m² in size and of several singular leaves in the vicinity.

Timothy Tabone, who found the population in 2008 and interviewed the owner of the land, reported that the plants grew from the gizzard contents of a Turtle Dove (*Streptopelia turtur* L.).



Figure 3. *Pteridium aquilinum* Wied il-Luq

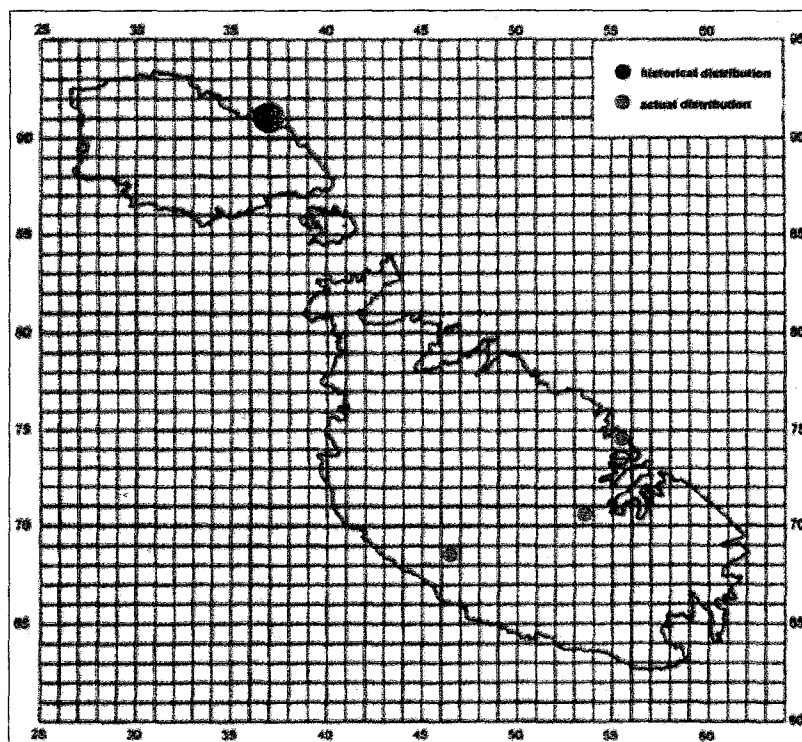


Figure 4. Distribution of *Pteridium aquilinum* in the Maltese islands (UTM, zone 33S, 1 km x 1 km grid)

Despite several surveys by both authors the *P. aquilinum* populations at Rdum il-Kbir and San Blas could not be reconfirmed and it can be assumed that the plant has become extinct in Gozo. The populations in Sliema where the plant was only a casual have disappeared, too. Thus the only remaining population in the Maltese islands seems to be the small clump near Buskett. However, considering the repeated sightings during the last decades, new cases of introduction of the species as well as the discovery of already established populations in other parts of the country are possible.

A voucher specimen of *Pteridium aquilinum* from the population at Wied il-Luq was deposited in the private herbarium of SVL.

Crataegus azarolus

Crataegus azarolus L., the azarole or Crete hawthorn, is a species of the Mediterranean, its range extending from Spain to North Africa, southern Russia and western Asia (Fiori 1969). The species has been cultivated since antiquity for its edible fruit and it is suspected that that only the populations in Crete (var. *aronia* L.) are native and that all other wild populations originated from cultivated plants (Tutin *et al.* 1968). In Sicily it is mentioned under the name of *Mespilus azarolus* Poir. in yellow and red fruited varieties (var. *fructo rubro* & var. *fructo flavo*) from the foothills of the Aetna (Tornabene 1887) but seems to be absent from the Pelagic islands of Lampedusa, Linosa and Lampione and also from Pantelleria (Sommier 1908).

The first record of *C. azarolus* from the Maltese islands is by Zerafa (1831) who does not specify whether the species is cultivated or found in the wild. Grech Delicata (1853) records it from sunny places at Wied Babu and Wied Balluta without providing a description. Gulia (1855-6) records it as naturalized in sunny places. Later the same author cites Wied Babu and Wied Balluta in Malta and Wied il-Lunziata in Gozo as locations (Gulia 1872). From a description of the fruit (Gulia 1872) it is obvious that he had seen *C. azarolus* and not *C. x ruscinonensis* Gren et Blanc. Duthie (1875) records *C. azarolus* from Wied ix-Xlendi in Gozo. Sommier & Caruana Gatto (1915) report that the wild plants found in valleys in Malta and Gozo are certainly *C. ruscinonensis* Gren. et Blanc. (*C. x ruscinonensis* Gren et Blanc.), which can be regarded as a subspecies of *C. azarolus* according to them.

Sommier & Caruana Gatto (1915) are also the first to record *C. x ruscinonensis* in the Maltese islands. Under *C. azarolus* Borg (1927) states that the typical form is not met with (in the wild) but he gives several locations for the var. *ruscinonensis* Gren (*C. x ruscinonensis*). Wolseley in Haslam *et al.* (1977) records *C. azarolus* populations from Wied Anglu in Malta and from Xlendi in Gozo. Since in Haslam *et al.* (1977) no distinction is made between *C. azarolus* and *C. x ruscinonensis* (which is not mentioned at all) and since we have surveyed the locations cited by Wolseley and found only *C. x ruscinonensis* there we believe that Wolseley did not encounter true *C. azarolus*. A reference: "Xlendi (Kramer & Westra," in Haslam *et al.* (1977) is probably an error since Kramer *et al.* (1972) do not mention *Crataegus*. Baldaccino & Stevens (2000) feature photographs of *C. azarolus* without providing a location but in our opinion those show *C. x ruscinonensis*. Although *C. azarolus* used to be frequently cultivated in the Maltese islands until the Second World War it seems that the last reliable published record from the wild is that of Duthie (1875) from Wied ix-Xlendi in Gozo.

Tabone, M. (1997), in an unpublished dissertation, records one single old specimen of *C. azarolus* from Wied Ghomor near St. Julians. In 2006 *C. azarolus*-populations were recorded by SVL at Wied il-Kbir near Qormi, at il-Palma (Wardija) at Wied Babu and at Wied Znuber. Single old trees were found by the same author near Wied Maqbul (2006) and at Mistra Valley (2007).

The population at Wied il-Kbir grew on a vertical cliff facing west and used to consist of ten trees, seven of them quite old but one of the old trees succumbed during the winter 2006/7. One single old tree grew in the vicinity of that population on a flat rock surrounded by cultivated fields. The population at il-Palma grew in a maquis environment at the base of a south-facing cliff and consisted of roughly 15 plants, two of them quite old. The population at Wied Babu consisted of two trees, one of them quite old on a stretch of flat rock surrounded by abandoned fields, of seven young plants in the upper parts of the valley and of one tree near the road to Blue Grotto. The population at Wied Znuber was the largest, consisting of over 30, usually quite large (up to 3 m) trees in the valley and on rocks among the surrounding fields. The old tree near Wied Maqbul grew between sparsely vegetated abandoned fields while the old tree in Mistra valley grew on former agricultural land in a habitat dominated by *Ceratonia siliqua* L., *Rubus ulmifolius* Schott. and *Acanthus mollis* L.



Figure 5. *C. azarolus* fruit, il-Palma



Figure 6. *C. azarolus* fruit, Wied il-Kbir



Figure 7. *C. azarolus* fruit, il-Palma

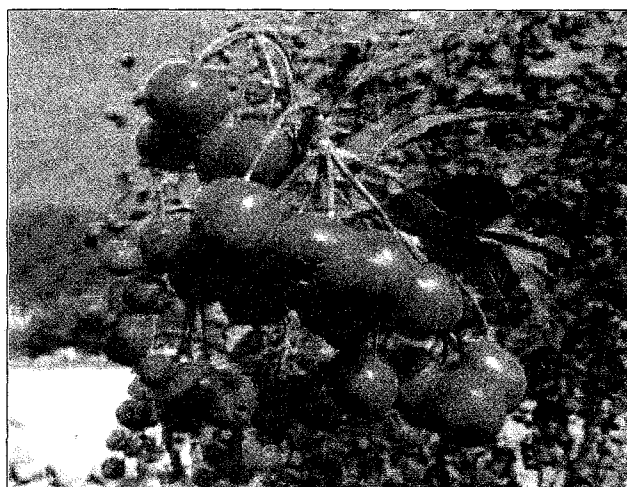


Figure 8. *C. x ruscinunensis* fruit, Selmun

All populations produced an ample amount of fruit in 2006 but due to the late autumn 2006 survey of the sites (end of September) intact fruit were encountered only at Wied il-Kbir and at il-Palma. The fruit from Wied il-Kbir were comparatively soft, red and of slightly irregular shape, the fruit from il-Palma were round, with the shape, colour, consistence and taste of a tiny apple. Although the two fruiting trees at il-Palma grew close together forming a single clump, one of them supplied reddish, the other yellowish fruit thus suggesting that the naturalized *C. azarolus* in Malta may belong to different varieties or cultivars (Fig. 3-5). According to Borg (1922) three cultivars of *C. azarolus* were occasionally grown in Malta: **Carvieri**, with fruit which is first yellow and then turns deep red; **Capitata**, like the wild form (*C. x ruscinonensis*) but with larger blossoms; **Francois Rigaud**, with yellow, rather small fruit.



Figure 9. *C. azarolus* flowers with several stigmata, il-Palma



Figure 10. Densely tomentose hypanthium and pedicels in *C. azarolus*

C. azarolus can be easily distinguished from the two other Maltese *Crataegus* (*C. monogyna* and *C. x ruscinonensis*) by the densely tomentose young twigs, leaves, hypanthium and pedicels, by the large (20-25 mm) orange-red or yellow fruit which contains (1) -3 seeds (Tutin et al 1968), by the coriaceous leaves and by the flowers which usually have 2-5 styles (Fiori 1969) (Fig. 3-8). In our opinion, using the leaf shape for identification of *Crataegus* in Malta does not seem feasible, since in all three entities almost entire to strongly lobed leaves can occur on the same plant, even on the same twig.

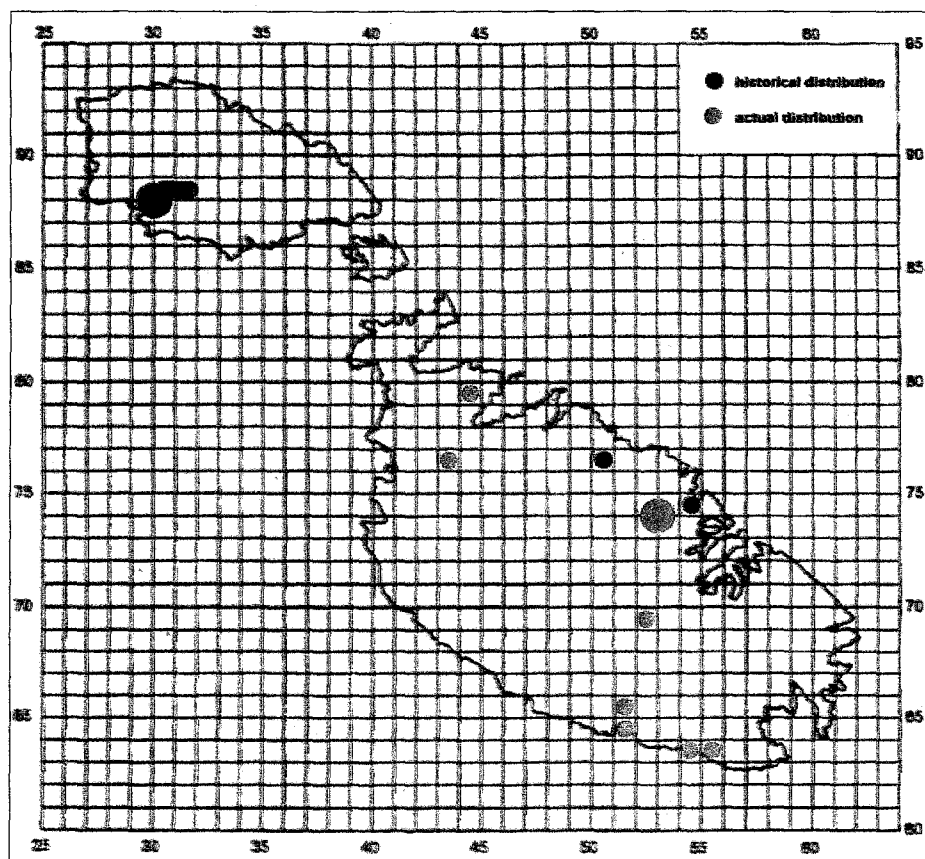


Figure 11. Distribution of *Crataegus azarolus* in the Maltese islands (UTM, zone 33S, 1 km x 1 km grid)

C. azarolus material in fruit from il-Palma was deposited in the private herbaria of both authors while *C. azarolus* material in flower from Wied il-Kbir was deposited in the Argotti herbarium of Malta.

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We wish to thank Ms Denise-Ann Buhagiar and Mr Joseph Buhagiar for their help with the Argotti Herbarium as well as Ms Ingrid Jordan-Thaden, Mr Guido Lanfranco, Mr Darrin T. Stevens and Mr Timothy Tabone for the information provided. We are also indebted to Mr Darrin T. Stevens and Mr Matthew Tabone for the permission to cite their records of *P. aquilinum* and *C. azarolus*. SVL also wishes to thank Mr Mario Gauci for the generous help during all visits to Gozo.

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REDISCOVERY OF *ASPLENIUM SAGITTATUM* AND *A. MARINUM* (PTERIDOPHYTA: ASPLENIACEAE) IN THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

Sdravko Vesselinov LALOV¹, Alena SEGINKOVA² & Joe SULTANA³

ABSTRACT

The rediscovery of *Asplenium sagittatum* and *A. marinum* on the islands of Malta and Gozo is reported reconfirming the presence of both species 81 years after the last historical records. The worldwide distribution is reported and historical records from the Maltese islands are cited. Habitat requirements in the Maltese islands are discussed. A short overview of Maltese Pteridopsida is given.

Keywords: *Asplenium sagittatum*; *A. marinum*; Pteridophyta; Maltese islands; Flora

INTRODUCTION

Nine presumably native species of Pteridopsida have been recorded from the Maltese islands. Of those only *Adiantum capillus-veneris* L. is fairly common in moist shady places in wells, caves and valleys. *Anogramma leptophylla* (L.) Link is an infrequent species of shady rocks and little caves, often found growing in patches of moss or green algae. *Asplenium ceterach* L. is a very rare species of old rubble walls and rocks in valleys. Five other species: (*Pteridium aquilinum* (L.) Kuhn; *Salvinia natans* (L.) All.; *Asplenium trichomanes* L.; *A. scolopendrium* L.; *A. sagittatum* (DC.) A. J. Bange and *A. marinum* L.) had been recorded from different locations in Malta and Gozo by Gulia (1909), by Sommier & Caruana-Gatto (1915) and by Borg (1927) but their presence could not be reconfirmed during the second part of the 20th century. *A. trichomanes* was recently rediscovered in Gozo (Tabone 2007). Recently several populations of *P. aquilinum* were found in Malta (Vesselinov Lalov & Lanfranco 2008). The single record of *Salvinia natans* published by Gulia fil. (1909) is based on a note from his father and is not substantiated. The records of *Asplenium scolopendrium* by Gulia (1909) and Borg (1927) which were not substantiated resulted maybe from confusion with *A. sagittatum* (Sommier & Caruana Gatto 1915). *A. sagittatum* and *A. marinum* were recorded for the last time by Borg (1927) in several locations both in Malta and Gozo but were assumed to be extinct by more recent authors (Lanfranco 1989; Tabone 2007).

During April 2008 the authors of the present paper carried out numerous surveys of areas with moist, shady rocks and caves in search for rare Pteridophyta. As a result of those surveys the presumably extinct *A. sagittatum* and *A. marinum* were found at several sites both in Malta and in Gozo and a population of the very rare *A. trichomanes* was found at Mistra Rocks in Gozo where the species had not been recorded before.

¹ Sauerbruchstr. 22, 67063 Ludwigshafen/Rh. Germany. Email: anwoda@pol.net (corresponding author)

² Wilsonova 5, 81107 Bratislava, Slovakia. Email: enviro@centrum.sk

³ Dar ta'Gajdoru / 3, Gajdoru Street, Xaghra, Gozo XRA 104, Malta. Email: joesultana@maltanet.net

Asplenium sagittatum

A. sagittatum is a species of the Mediterranean (Tutin *et al.* 1993) growing in Spain, including the Balearic islands, France, including Corse, Italy, including Sardinia and Sicily, Malta, Croatia, Greece, Lebanon, Syria, Israel, Jordan, Lybia, Algeria, Tunisia and Morocco (Greuter *et al.* 1984). The species is infrequent to rare in Italy, Sardinia, Sicily and the Balearic islands and very rare in France, Spain and the Balkans. Its typical habitat consists of moist, shady, calcereous rocks (Tutin *et al.* 1993).

In the Maltese Islands Duthie (1872) records the species under the name of *Scolopendrium hemionitis* Sin. from coastal rocks near Nadur (probably Mistra rocks = Rdum il-Kbir). Caruana Gatto (1893) records it under the same name from Mellieha in Malta and Rdum il-Kbir in Gozo. Gulia (1909) records it under the same name from Dwejra, the valleys of Nadur, Xlendi valley and Ras il Kala (Qala) in Gozo and Mellieha in Malta while he records the similar *Scolopendrium vulgare* (*Asplenium scolopendrium*) from moist rocks at Wied Babu and Wied Ghomor in Malta. Sommier & Caruana Gatto (1915) record *S. hemionitis* from Mellieha, Rdum il-Kbir, Xlendi, Nadur, Dweira and Qala.

Borg (1927) records it from Mellieha, Ghajn Tuffieha and from many wells in Mosta, Lija and Birkirkara in Malta and from Rdum il-Kbir, Ghajnsliem, Qala, Dwejra and Xlendi in Gozo. He records *S. vulgare* from Wied Babu, Wied Ghomor and Wied il-Ghasel in Malta (*ibidem*). According to Sommier & Caruana-Gatto (1915) the records of *S. vulgare* from Malta might be the result from confusion with *S. hemionitis*. According to Lanfranco (1989) and Tabone (2007) the records of *A. scolopendrium* (*S. vulgare*) from the Maltese islands are unsubstantiated. No recent records of *A. sagittatum* are available from the Maltese islands. Haslam *et al.* (1977) cite only old records. Lanfranco (1989) states that the species might be already extinct. Tabone (2007) regards it as extinct.

On the 3th April 2008 two of us (SVL & JS) found three small populations of *A. sagittatum* consisting of 20 specimens in dark, moist caves under large boulders in the eastern part of the Mistra Rocks scree (Rdum il-Kbir) in northeastern Gozo. In addition three specimens of the very rare *A. trichomanes* were found growing near one of the *A. sagittatum* populations. On the 6th April five specimens were found in two caves of the nearby scree Rdum San Filip by SVL. On the 7th April a population with 22 individuals was found by the same author on a shady little cliff at the scree Rdum il-Qawwi on the Marfa Peninsula in western Malta while two solitary specimens were found in nearby caves.

On the 9th April the same author found a population consisting of 25 specimens in a cave in the western part of Mistra Rocks near San Blas. On the 27th April AS & SVL found single specimens in 4 different locations in the eastern and central parts of Mistra Rocks. The species was not found during surveys of areas with moist rocks and caves at Dwejra, Xlendi, Qala, Wied Babu, Wied Ghomor, Ghajn Tuffieha or Birkirkara from where it had been recorded in older publications.

While Borg (1927) records *A. sagittatum* from moist and shaded rocks, wells and caves in urban areas, valleys and screes all recent sightings have been from coastal screes where the species grows in shady (light to) dark (to very dark) places, mainly in caves but sometimes in moist, north facing cliffs or in small holes in the coralline limestone. In most locations no other vascular plant species were found in the vicinity but in some cases *A. leptophylla*, *A. trichomanes*, *Parietaria lusitanica* L. and *Tamus communis* L. as well as some moss and green algae grew in the same caves.



Figure 1. *Asplenium sagittatum*, Rdum il-Kbir, Gozo

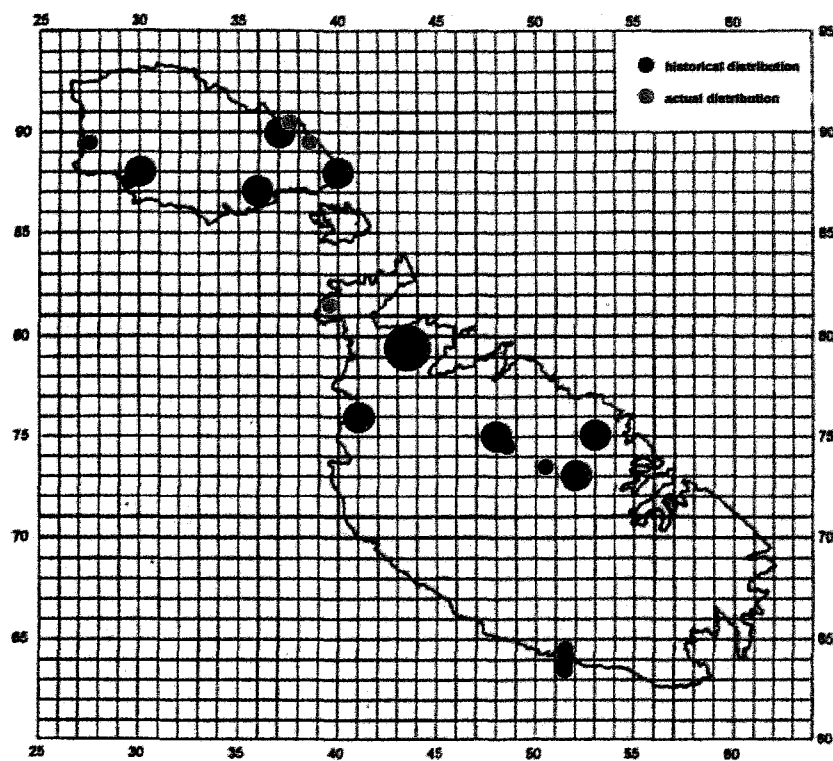


Figure 2. Distribution of *Asplenium sagittatum* in the Maltese islands (UTM, zone 33S, 1 km x 1 km grid).

Asplenium marinum

A. marinum is a species of Western Europe, extending eastwards very locally to southern Italy (Tutin *et al.* 1993). Its range includes Portugal, Spain including the Balearic islands, France including Corse, Malta, Algeria, Morocco, Italy, including Sicily, Sardinia (Greuter *et al.* 1984) and Pantelleria, the Azores, Madeira, the British isles and western Norway. While the species is relatively common along the coasts of the British isles and of Brittany it is very rare in Italy. Its typical habitat is on rocks and walls exposed to sea-spray (Tutin *et al.* 1993).

In the Maltese islands the plant was first recorded under the name *Asplenium lucidum* by Boccone (1697) who states that it was found in Gozo by Signor Narduccio Murmuro. Duthie (1875) records it from rocks on the coast near Nadur (probably Mistra rocks = Rdum il-Kbir). It was recorded from Xlendi and Rdum il-Kbir in Gozo by Caruana Gatto (1893). Gulia (1909) records it from Xlendi, Rdum il-Kbir and Dwejra. Sommier & Caruana Gatto (1915) record it from Wied il-Ghasel and Wied iz-Zurrieq in Malta and Xlendi, Rdum il-Kbir, Mgarr ix-Xini and Dwejra in Gozo. Borg (1927) records it from Wied il-Ghasel, Wied iz-Zurrieq and Mellieha in Malta and from Xlendi, Rdum il-Kbir, Mgarr ix-Xini and Dwejra in Gozo.

As in the case of *A. sagittatum* no recent records of *A. marinum* are available from the Maltese islands. Lanfranco (1969) mentions that the plant is rare but he did not encounter it in the wild (Edwin Lanfranco personal information). Haslam *et al.* (1977) cites only old records. Lanfranco (1989) states that the species was not recorded for at least 50 years while Tabone (2007) regards it as extinct.

On the 18th April one of the authors (SVL) found a population of *A. marinum* consisting of 8 mature individuals and numerous immature specimens in a deep rock crevice in the area of Ras il-Griebeg near Mellieha in northern Malta. On the 27th April AS & SVL found a single mature specimen of *A. marinum* in a rock crevice in the western part of Mistra Rocks in Gozo. The species could not be found during surveys of areas with similar habitat at Dwejra, Xlendi, Wied il-Ghasel or Wied Zurrieq from where it had been recorded in older publications.



Figure 3. *Asplenium marinum*, Ras il-Griebeg, Malta.

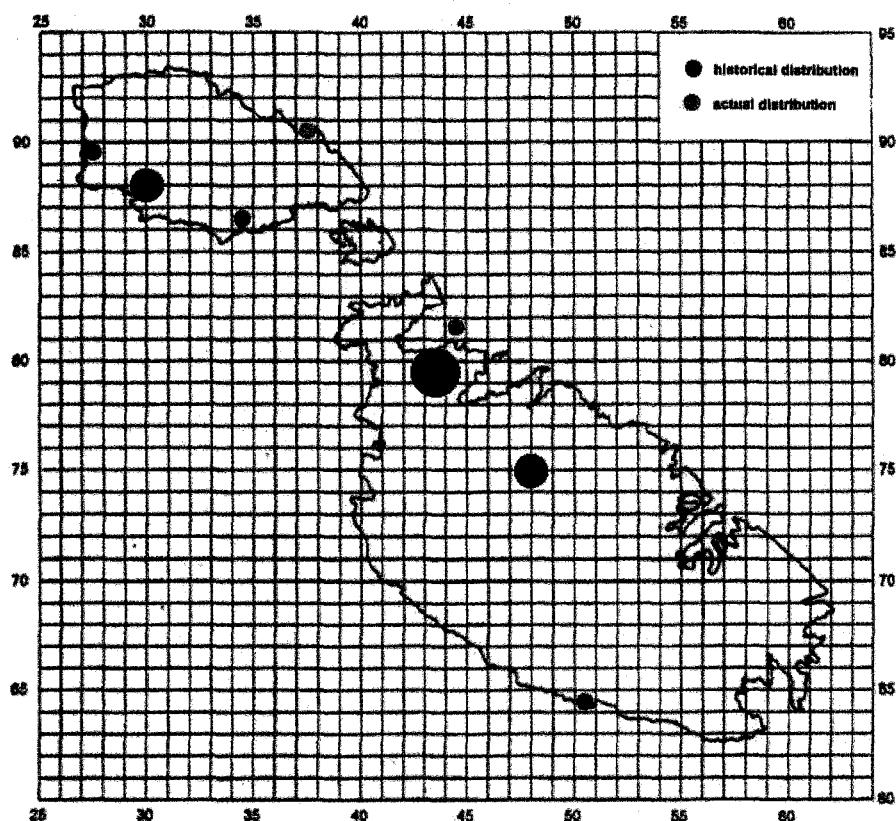


Figure 4. Distribution of *Asplenium marinum* in the Maltese Islands (UTM, zone 33S, 1 km x 1 km grid).

Although the data from only two locations seems insufficient to determine the habitat requirements of the species in the Maltese islands both recent sightings are from shady, moist, light to very dark crevices in coralline limestone screes less than 30 m from the sea. In both cases no other vascular plant species were found nearby but some moss, lichen and green algae grew in the vicinity.

DISCUSSION

While both species were recorded from various locations in Malta and Gozo before 1927 no records exist from the time between 1927 and 2008. Although fluctuations in population size due to climatic or other factors cannot be excluded we believe that the existing populations have been overlooked during the last 81 years. All areas where both species were recorded recently consist of giant screes with boulders up to 50 m in size and are almost inaccessible without experience in rock-climbing. All populations are very small and localized. The plants usually grow in dark caves which are rarely surveyed by botanists. Furthermore at a casual glance mature specimens of *A. sagittatum* can be easily confused with *Arum italicum* Mill. or *Arisarum vulgare* (Targ.) Toz., which occur in the same places, while very young specimens of both species resemble young specimens of *Adiantum capillus-veneris*. We assume that both species can be found in other screes and maybe even in valleys or wells in the Maltese islands.

While pollution, depletion of the aquifer, climate change or even harvesting by plant collectors might pose some threat to those populations the biggest possible danger arises from destruction of the habitat. To protect one of the most beautiful and spectacular landscapes in the Maltese islands we strongly recommend that the unique screes in the Mistra rocks (Rdum il-Kbir) area, together with the surrounding clay slopes, valleys, coastal cliffs and garrigue communities are declared a Natura 2000 site.

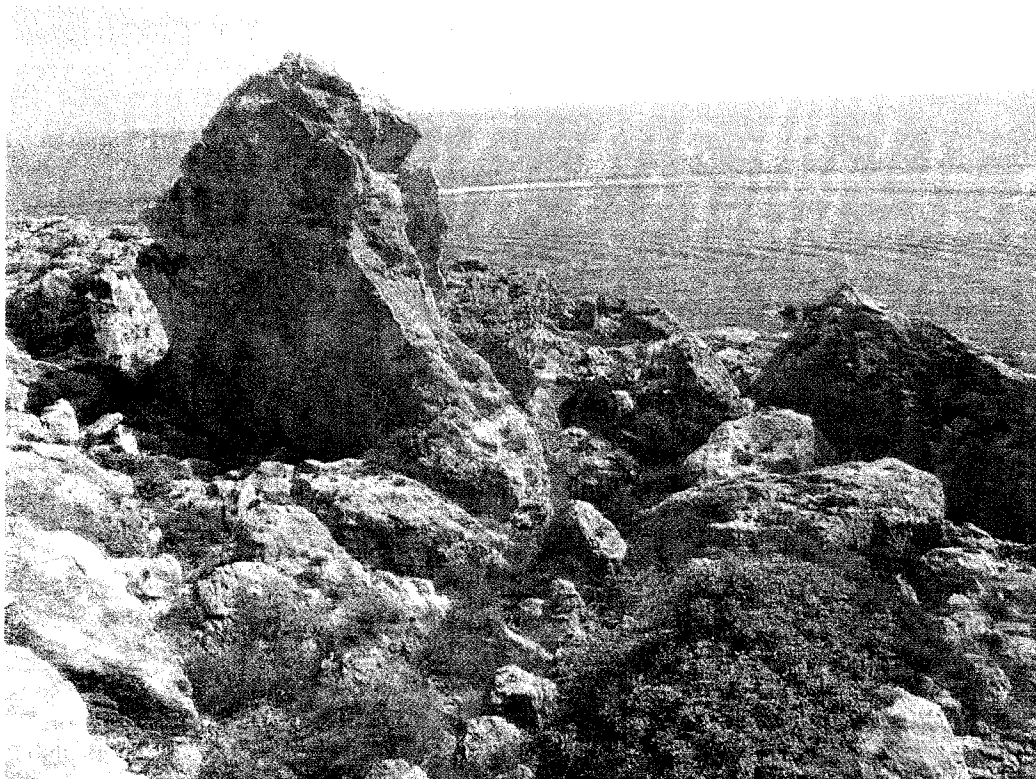


Figure 5. Rđum il-Kbir, typical habitat of *Asplenium sagittatum* and *A. marinum*.

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A very special thank goes to Mr Mario Gauci for his generous help with advise, accommodation, transport and equipment during all visits to Gozo. Furthermore the authors are indebted to Mr Joseph Attard Tabone, Mr Edwin Lanfranco, Mr Martin Psaila, Mr Darrin T. Stevens and Ms Claire Zarb for further help with accommodation, transport, equipment, information and literature.

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THREE NEW SPECIES FROM THE GENUS *OPHRYS*, SECTION PSEUDOPHRYS [FAM: ORCHIDACEAE] ON THE MALTESE ISLANDS.

Stephen MIFSUD¹

ABSTRACT

This article deals with the first substantiated records from the Maltese islands of *Ophrys lupercalis* J. Devillers-Terschuren & P. Devillers and *Ophrys lojaconoi* P. Delforge, both forming part of the *Ophrys fusca* group, and of *Ophrys phryganae* J. Devillers-Terschuren & P. Devillers, belonging to the *Ophrys lutea* group. Identification is based on isometric morphological analysis, following the Delforge taxonomical system. Treatment of these taxa according to another taxonomical system by Baumann, Kunkle and Lorenz is also discussed.

Keywords: *Ophrys lojaconoi*; *Ophrys lupercalis*; *Ophrys phryganae*; *Ophrys fusca* group; *Ophrys lutea* group; Malta

INTRODUCTION

Using isometric morphological analysis and taxonomy by Delforge (2006), *Ophrys lupercalis* J. Devillers-Terschuren & P. Devillers and *Ophrys lojaconoi* P. Delforge from the *Ophrys fusca* group and *Ophrys phryganae* J. Devillers-Terschuren & P. Devillers from the *Ophrys lutea* group have been identified from the Maltese islands. These 3 species are not included by Bartolo *et al.* (2001) in their comprehensive article on Maltese orchids, listing 33 different *Orchidaceae* species and consequently, they have not been reported to occur in Malta so far. Lanfranco (2007) and Delforge (2006) have already indicated an assumptive presence of *O. lupercalis* on the Maltese islands, whilst Lanfranco (2007) suggested *O. phryganae*, both without substantiated records.

Ophrys lupercalis J. Devillers-Terschuren & P. Devillers

(= *Ophrys fusca* auct. non Link, *O. 'nigroaenea-fusca'* H.F. Paulus & Gack nom. prov.);

Malta: Dingli (11-I-2008. leg./det. Stephen Mifsud); Pembroke (30-I-2008. leg./det. Stephen Mifsud); Wardija (23-II-2008. leg./det. Stephen Mifsud)

The occurrence of *O. lupercalis* on the Maltese islands has always been doubtful (Delforge, 2006) or without substantiated records (Lanfranco, 2007). The *Ophrys* species flowering in January-February in Malta are mostly dominated by the *Ophrys iricolor* group, one of which is identified by Bartolo *et al.* (2001) as *Ophrys* cf. *mesaritica* Delforge, the other being *Ophrys vallesiana* J. Devillers-Terschuren & P. Devillers, that starts flowering in mid February. During some research on the early flowering *Ophrys* species, the author found specimens that did not belong to the *Ophrys iricolor* group because the lip did not possess elevated basal ridges that are turned sideways, which is considered as a distinguishing characteristic for this group. Instead, there were swollen basal prominences as in the species of the *Ophrys fusca* group. A patch of twelve to fifteen such orchid individuals, with morphological characteristics similar to *O. lupercalis*, was found on the 11th of January 2008 in a labiate garigue at Dingli Cliffs, Dingli. On the 30th of January, four other specimens were found at Pembroke and other such typical populations of *O. lupercalis* were later observed at Wardija (San Martin area) on the 23rd of February 2008. Their habitat was a labiate garigue with *Thymus capitatus* (L.) Hoffsgg. & Link being one of the dominant species.

¹ 32 "Gardenia", triq il-Batterija, Santa Venera SVR1430 Email: info@maltawildplants.com



Figure 1. *Ophrys lupercalis* J. Devillers-Terschuren & P. Devillers from Malta

The most important characteristic features recorded from these specimens and that correspond to *Ophrys lupercalis* are given in Table 1. The table also highlights several differences from the closest relative – *Ophrys fusca* s.str., which had already been recorded in Malta by several previous authors, the latest record being that of Bartolo *et al.* (2001). Table 1 makes reference to Figure 2 showing some of the morphological features of the specimens photographed in Malta.

Table 1: Main characteristic features of *O. lupercalis* compared with those of a close relative species - *O. fusca* s.str Link. Adapted from Delforge (2006).

	<i>O. lupercalis</i>	<i>O. fusca</i> s. str.
Lip Length	(10-)18mm	15-22mm
Colour of tepals	Green (Fig 2a, 2b)	Yellowish or pale green
Colour at base of lip	Faint (Fig 2d)	Colourful
Colour at tip of lip	Drab, dull dark brown	Vivid dark brown
Colour of speculum	Light colour; pale blue, greyish or milky (Fig 2a, 2b)	Variable but more saturated colour; mostly azure blue.
Labellum hair	Long (Fig 2c, 2f)	Moderate
Underlip	Pale green or sometimes with a faint reddish tint at centre (Fig 2e)	Predominantly green, sometimes broadly tinted purple-brown.
Speculum hair	Little to none (Fig 2c)	Sparse grey hair
Flowering time	(Dec-)Feb-Mar(-Apr)	(Jan-) Mar-May

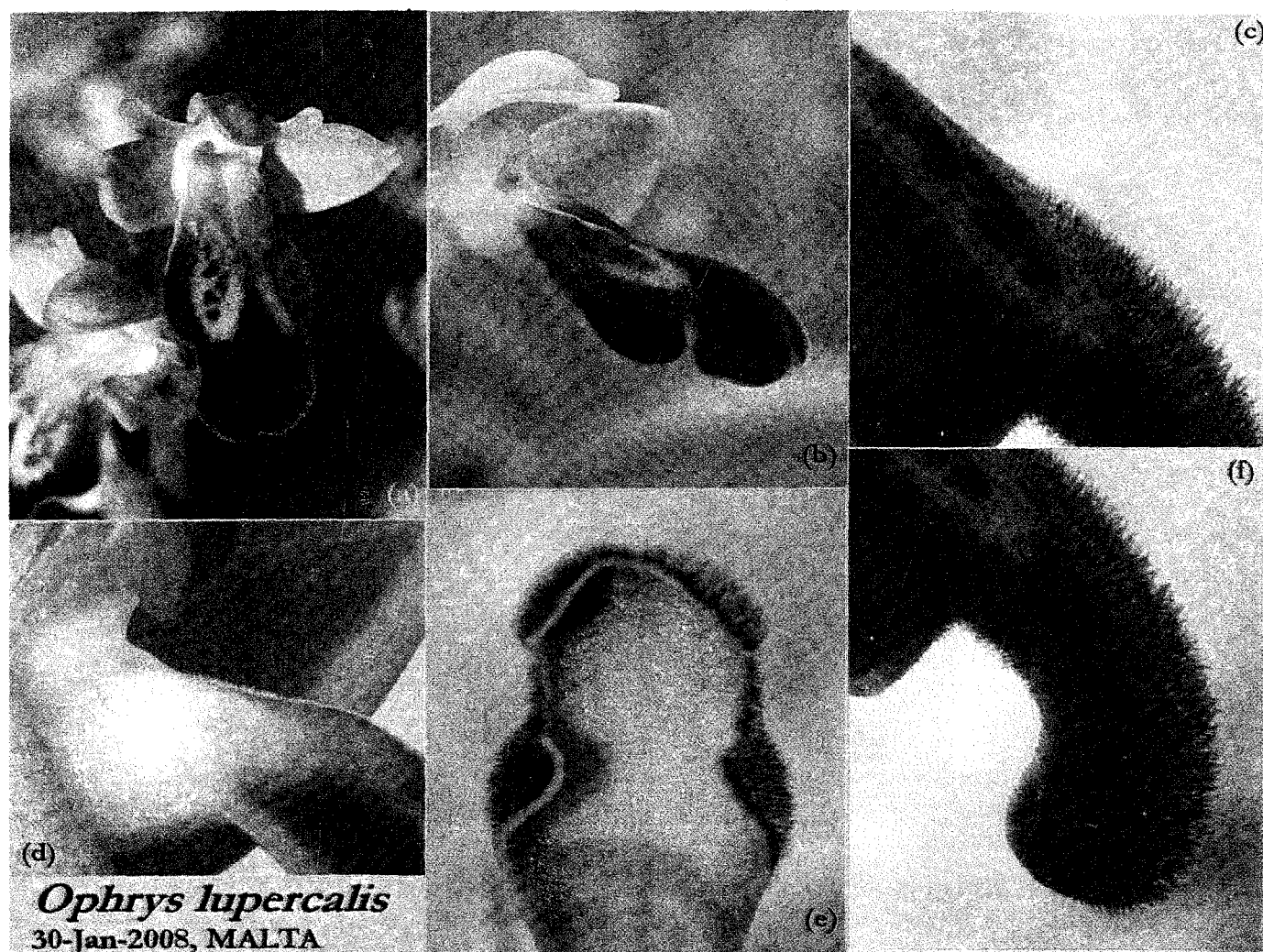


Figure 2 a-f. Photos of *Ophrys lupercalis* J. Devillers-Terschuren & P. Devillers from specimens in Malta showing the most distinctive features of this species.

The length of the lip of the specimens found was measured and was found to vary between 13-15mm, which is considerably shorter from the average length of *O. fusca* s.str. - 18-20mm. The shorter lip length together with a pale speculum, lack of labellar basal ridges (thus not *O. iricolor* group) and the rather early flowering period (typically starting in mid January and February), are the most important preliminary characteristics, observed in the field, for *O. lupercalis*, in the Maltese Islands.

O. lupercalis was first found in Aude, France in Feb, 1996 and it is further distributed in Algeria, Portugal, Spain (including the Balearic Islands), Andorra, France, Sardinia and Sicily (Delforge, 2006). Along with Tunisia, Malta and peninsular Italy are given as doubtful localities by the same author.

***Ophrys lojaconoi* P. Delforge**

(= *Ophrys iricolor* Desfontaines subsp. *lojaconoi* (P. Delforge) Kreutz);

Gozo: Żebbuġ (04-III-2008. leg./det. Stephen Mifsud)

Ophrys lojaconoi was first described by Delforge in 1995 from Foggia (Apulia, Italy). He placed it in the *Ophrys fusca* group, despite the plant having elevated ridges as those in the *Ophrys iricolor* aggregate. It has not been confirmed, but possibly, Delforge did not consider the basal ridges of the lip to be turned sideways enough as in the other species of the *Ophrys iricolor* group. Since the current study is based on the taxonomical system reported in Delforge (2006), *O. lojaconoi* will be treated as a member of the *Ophrys fusca* group.

Ophrys lojaconoi has never been reported from the Maltese Islands - neither mentioned at an assumptive level in Lanfranco (2007), nor reported by Bartolo *et al.* (2001), nor by Delforge (2006).



Figure 3: *Ophrys lojaconoi* from a moist and shaded habitat in Gozo

This could be due to the fact that *O. lojaconoi* may be rare in Malta; in fact, the author himself has only managed to record one population, consisting only of two specimens from the island of Gozo, more precisely on a hill in Żebbuġ called Ta' Kuljat. The habitat was half shaded and rather moist and the plants were growing on damp soil over karstic rock dominated by growth of moss and specimens of *Valantia muralis* L., as shown in Figure 3 and Figure 8. This moist and partly shaded habitat matches with that given for *O. lojaconoi* by Delforge (2006). The main characteristics of this species are given in Table 2.

Table 2. Main characteristic features of *O. lojaconoi* adapted from Delforge (2006), except ⁽¹⁾ which are the author's own observations.

	<i>O. lojaconoi</i>
Base of lip	Marked, elevated into ridged plateaus (Fig 4a)
Length of lip	12-15mm (Fig 4b) / median lobe up to 8mm
Lip longitudinal plane	Horizontal (Fig 4d)
Lip margin⁽¹⁾	Thin yellow edge (4a, 4c)
Lip hairs	Straight, long, dense, dark with a purple tinge.
Lateral lobes	Reduced, short and narrow (Fig 4b, 4c)
Sinuses	Wide (Fig 4b, 4c)
Angle between the longitudinal axis of lip and the side of the lateral lobe.⁽¹⁾	Very acute: 22°-26° (Fig 4c)

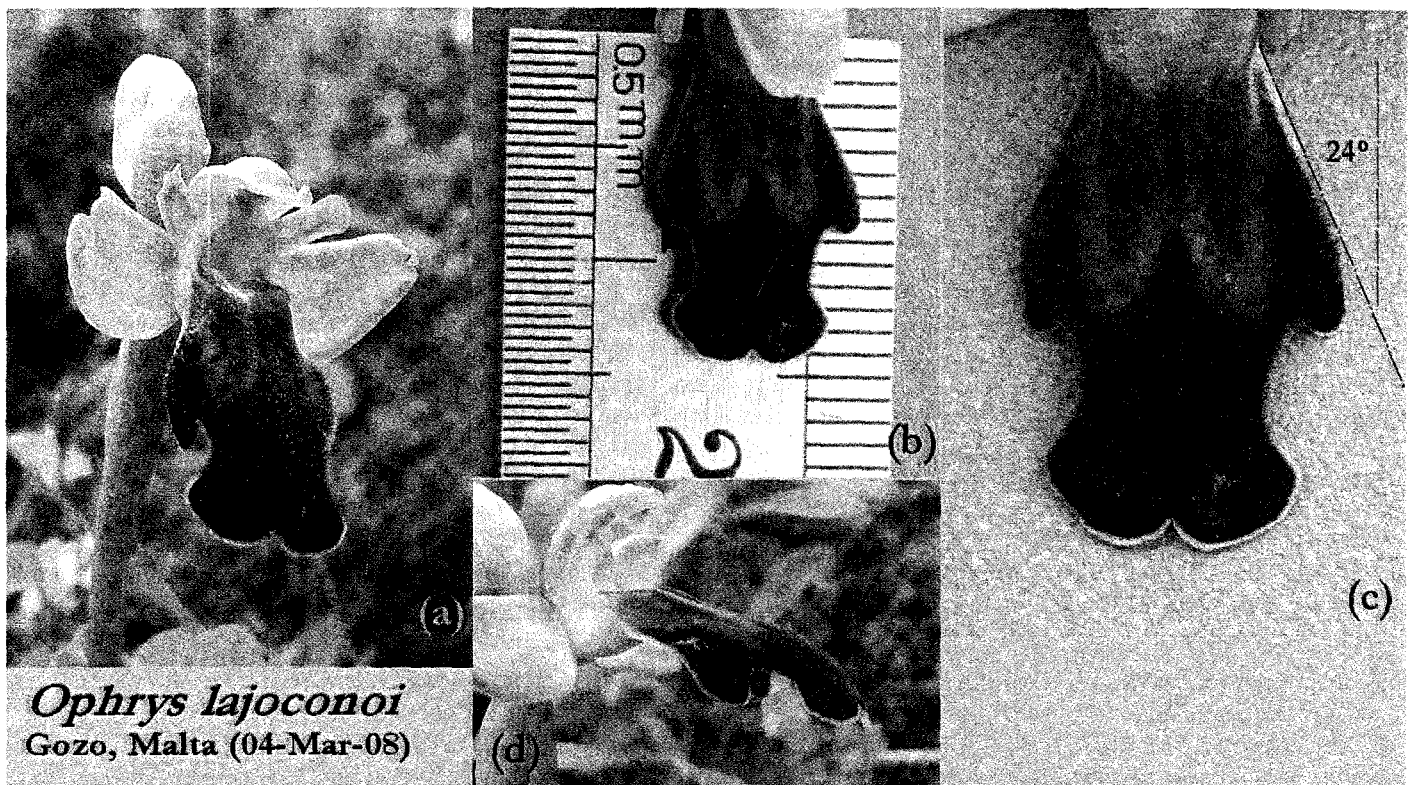


Figure 4 a-d. Photos of *O. lajoconoi* highlighting the most distinctive features

The most distinguishing features of *O. lajoconoi* in the field are the small lateral lobes, which as a result leaves wide sinuses and a rather elongated median lobe. It is described to flower between February and April (Delforge, 2006), and in fact, the first flowers in individuals from the Maltese population were recorded in bloom on the 4th of March, 2008. The moist, semi-shaded habitat is also a feature to be attributed some importance, since many *Ophrys fusca* s.l. and *Ophrys iricolor* s.l. in Malta are often found in a relatively more exposed and arid habitats.



Figure 5. Underlip of *Ophrys lajoconoi* from Malta

O. lojaconoi has several morphological influences reminiscent of the *Ophrys iricolor* group. The most important ones are the elevated ridges at the basal part of the lip, and also the red-tinged underlip with a distinct green border as shown in Figure 5. Additionally, the acute angle (c. 24° with reference to fig 4c) between the side of the lateral lobe and the longitudinal axis of the lip is well below the range of 30° to 40° which, for many years, was used in conventional identification keys, as the main characteristic feature for the identification of the *O. fusca* group. It is hence more similar to the Maltese *Ophrys iricolor* s.l. (namely *O. vallesiana* and *O. cf mesaritica*) than to any member of the *Ophrys fusca* group.

The recorded presence of *Ophrys lojaconoi* in Malta provides more distributional data for the species within the Mediterranean region, with such data being to date, according to Delforge (2006) rather scant. The same author states that this species is found along the Adriatic side of the Italian peninsula, where the Italian region of Apulia is situated, specifically from Mount Gargano in Foggia to the south of Brindisi. In another report, Delforge (2003) claims that he did not find this species in the Italian region of Calabria, located at the southeast part of mainland Italy. Records of *O. lojaconoi* from Sicily require verification, since the only references available to Delforge (2003) were online ones.

***Ophrys phryganae* J. Devillers-Terschuren & P. Devillers**

(= *Ophrys lutea* Cavanilles subsp. *phryganae* (J. Devillers-Terschuren & P.Devillers) Melki);

(= *Ophrys corsica* (Soleirol ex G. & W. Foelsche);

Malta: Dwejra (17-III-2008. leg./det. Stephen Mifsud / Leslie Lewis & Stephen Mifsud)

The member species of the *Ophrys lutea* group in Malta given by Bartolo *et al.* (2001) are *Ophrys lutea* Cavanilles subsp. *lutea* and *Ophrys sicula* Tineo (= *Ophrys lutea* Cavanilles subsp. *minor* (Tod.) O. & E. Danesch.). They are distinguished by their different size of the labellum, where the former has a length of 14-18mm whilst the latter is notably shorter - 8.0 - 14.5mm (Delforge, 2006). The author was shown a population of what was supposedly a *Ophrys sicula* one, by Michael Briffa at Dwejra (mainland Malta) on March 2007. According to Bartolo *et al.* (2001), this population should correspond to the population recorded by Schembri *et al.* (1987) when *Ophrys phryganae* had not yet been described.

On analysing the morphological features of this population one year later in March 2008, it was found that the lip was kinked at the base and consequently bent downwards at an angle of 40-50 degrees. This is a crucial morphological characteristic of *Ophrys phryganae* described by J.Devillers-Terschuren & P.Devillers in 1991 and eventually used by Delforge (2006) to key it out from *O. sicula* which has a slightly smaller lip size. The author compared the shape of the lip of this population with the *Ophrys sicula* situated at Għar il-Kbir, Dingli (Bartolo *et al.*, 2001) and a marked difference emerged. The lip of the specimen of Għar il-Kbir was observed to be almost horizontal and without an evident kink at the base. The difference between *O. sicula* from Dingli and *O. phryganae* from Dwejra can be seen in Figure 6.

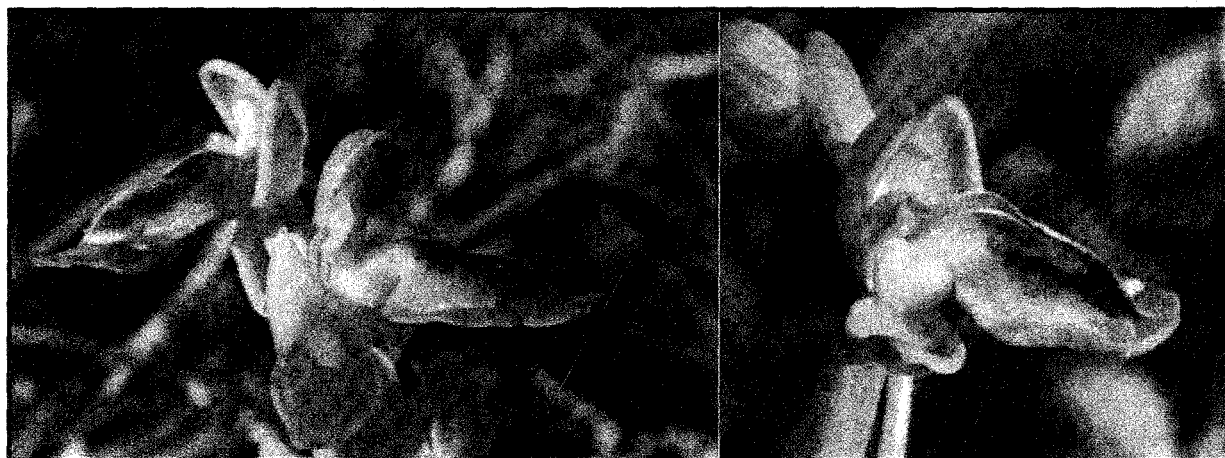


Figure 6. Lateral view of *Ophrys sicula* (Dingli, Malta) on the left and *Ophrys phryganae* (Dwejra, Malta) on the right with its distinguishing kink at the base of the lip.

The population of *O. phryganae* from Dwejra was constituted by some twenty to twenty-five specimens, spaced out at an occupying area of 5-6m. Ten specimens were randomly selected for morphological isometric analysis to identify the species, and while they all had a marked kink at the base of the lip, the lip-length varied from 11mm to 14mm. Despite being relatively numerous, the same individuals are threatened by high vegetation, composed mainly of large numbers of *Asphodelus aestivus* Brotero and *Bituminaria bituminosa* (L.) Stirton. Actually, the *O. phryganae* population was restricted to a small patch where *Asphodelus aestivus* was found in moderate numbers.

Delforge (2006) states that *Ophrys phryganae* was first described from Lassithi, Crete in 1991, and the distribution of this species is poorly known, but gives the following countries of distribution: France (Corsica only), Greece (including Crete and the eastern Aegean archipelago), Italy (Sardinia only), Turkey (Anatolia only), former Yugoslavia, and doubtfully in Sicily. Baumann *et al.* (2006) reports it from Greece, Southwest Turkey and as doubtful in Italy.

Protection of *Ophrys* species on the Maltese Islands

All species of the *Ophrys fusca* group (quoted as “*Ophrys fusca* Link s.l.”) are legally protected through the Flora, Fauna and Natural Habitats Protection Regulations, 2006 (Legal Notice 311 of 2006), as published through the Environment Protection Act and the Development Planning Act. Since *Ophrys luperca* and *Ophrys lojaconoi* are part of this group, they are therefore also protected. On a similar note, since *Ophrys phryganae* is also regarded as a subspecies of *Ophrys lutea*, the latter is safeguarded through the same legal provisions. This schedule lists a number of animal and plants species of national interest in need of strict protection.

Distribution of the three *Ophrys* species found on the Maltese Islands:

Ophrys luperca

Malta: Dingli* (11-I-2008); Pembroke* (30-I-2008); Wardija* (23-II-2008)

Ophrys lojaconoi

Gozo: Żebbuġ* (04-III-2008)

Ophrys phryganae

Malta: Dwejra* (17-III-2008)

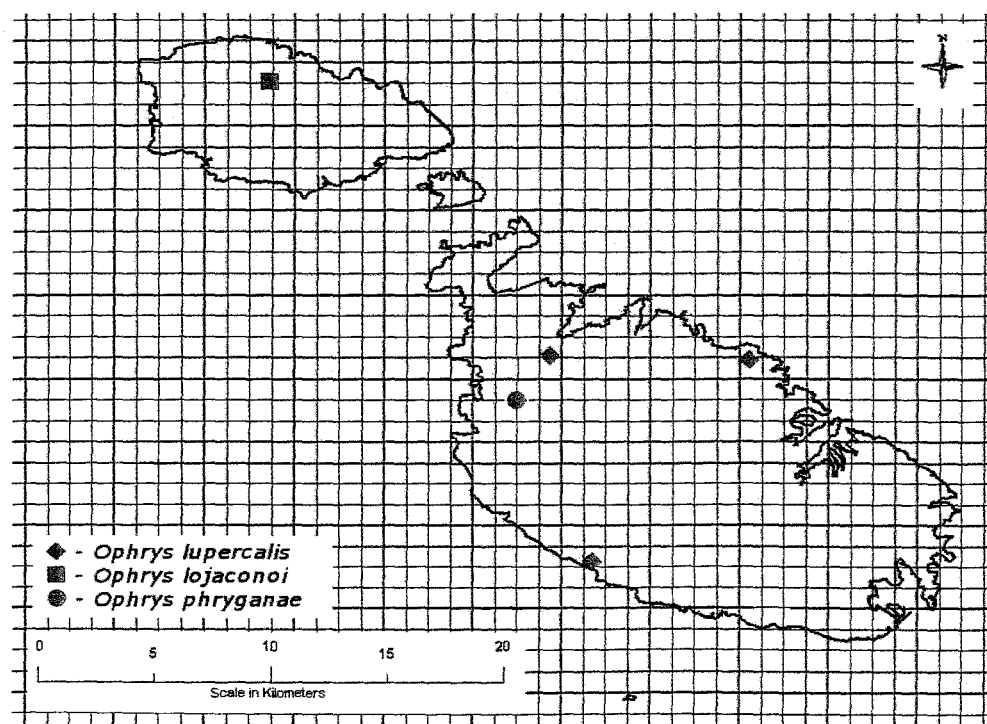


Figure 7. Distribution of the three *Ophrys* species reported in this study in the Maltese Islands (UTM, zone 33S, 1 km x 1 km grid).

DISCUSSION

The identification of these orchid species is controversial, and this paper is based on the taxonomic approach adopted by Delforge (2006), which treats many taxa as valid species. Nevertheless, this approach is not adopted in all systems. For instance, in their recent analysis on orchids, Baumann *et al.* (2006) tend to either 'lump' some of the species in Delforge (2006) into a single taxon, or give them a different taxonomic rank, often a lower one. For instance, *Ophrys lupercalis* and *Ophrys lojaconoi*, together with five other species, are all treated by Baumann *et al.* (2006) as *Ophrys fusca* Link subsp. *fusca*. Similarly, within the *Ophrys lutea* group, *Ophrys phryganae*, is only recognized as a subspecies of *Ophrys lutea*, i.e. *Ophrys lutea* subsp. *phryganae*; the same applies for *O. sicula* and *O. lutea* s.str., both of which are reported from Malta by Bartolo *et al.* (2001).

At the time of writing, both taxonomic systems were and could be widely used, as long as the system adopted is cited. The aim of this paper is not to determine which system is to be used, or which taxon is to be reported. One should also mention the consequences of taxonomic exaggeration, which according to Pillon & Chase (2007), is evident in the taxonomy of European orchids. Describing new species as a result of the existence of minor morphological differences, sometimes simply originating from site-specific adaptations, including adaptations to local pollinator species, may lead to poorly circumscribed orchid taxa. According to Pillon & Chase (2007), this phenomenon constitutes "a serious obstacle to their (orchid species) conservation because rare, poorly defined species may be prioritized for conservation over taxonomically 'good' species".



Figure 7: *Ophrys lupercalis* J.Devillers-Terschuren & P.Devillers from Pembroke, Malta - 30-I-08



Figure 8: *Ophrys lajoconoi* P. Delforge from Zebbug, Gozo (Maltese Islands) - 4-III-08



Figure 9: *Ophrys phryganae* J. Devillers-Terschuren & P.Devillers from Dwejra (Malta) - 17-III-08

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The author is indebted both to Mr. Les Lewis actively involved in the study of Orchidaceae and author of *O. insectifera* forma *luteomarginata*, and to Dr. Errol Vela an Orchid specialist and authority for proof reading this article, supplying reference articles and providing additional support. Special thanks also to Mr. Darrin T. Stevens for supplying additional reference material and for extensive personal consultation.

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AN ASSESSMENT ON THE DISTRIBUTION OF *IRIS PSEUDOPUMILA* TINEO [FAM. *IRIDACEAE*] IN THE MALTESE ISLANDS AND COMPARISON OF ITS TWO FLOWER FORMS.

Stephen MIFSUD¹

ABSTRACT

The distribution of *Iris pseudopumila* Tineo in the Maltese islands is given, including information on four new populations. A comparison study between three populations of the yellow-flower form, and between the violet and yellow forms are provided, the latter showing marked morphological differences between the two colour forms in the Maltese islands.

Keywords: *Iris pseudopumila*, Distribution, Malta

INTRODUCTION

Iris pseudopumila Tineo, Cat. Pl. Horti Panorm. 283 (1827); (= *I. panormitana* Tod.; *I. lutescens* Guss. non Lam.) also known as the Southern Dwarf Iris, has been reported to be found in Italy, Sicily (including the Maltese archipelago) and West region of former Yugoslavia (Tutin *et al.*, 1980). Pignatti (1982) specifies this species is only found in the Italian regions of Apulia and Sicily (precisely in Messinese, Palermo, Nebrodi and Etna), while Conti *et al.* (2005) add the regions of Basilicata and Molise, further stating that the plants used to be reported from the region of Campania are no longer recorded.

The records from West 'Yugoslavia' (probably Dalmatia) could not be verified thoroughly, although Bogdanovi *et al.* (2004) exclude *I. pseudopumila* from the checklist of the Croatian flora. Unless its status in the newly independent state of Montenegro is clarified, we concord with Pignatti (1982), adding that the distribution of *I. pseudopumila* is endemic to the Central Mediterranean region, more specifically ranging from Molise (Northmost), Apulia (Eastmost), Palermo in Sicily (Westmost) to the Maltese Islands (Southmost).

The main morphological characteristics of *I. pseudopumila* are its a rhizomous (non-tuberos) low-growing form, with one flower (seldom two to three). The external tepals (down tepals) have a characteristic beard in the form of a central, longitudinal, linear band. The perianth tube is longer by 3-5 times the ovary. The flowers are usually lower from the erect, ensiform leaves, and 2 main colour forms exist - deep purple and yellow. Fruit is a dehiscent, fusiform capsule. This species prefers arid pastures and garigue habitats Pignatti, 1982). A third colour form - off white/cream, is also reported from Italy (Fiori, 1923-1929) but is very rare and so far not known from the Maltese islands (Stevens, D.T., pers. comm. Sep-2008).

Distribution of *Iris pseudopumila* on the Maltese Islands

Despite its conspicuous flowers, the earliest reference to a presence of *I. pseudopumila* from Malta was in 1976 by Mario Gauci (Wayfarer, 1976). He reported that the first population of *I. pseudopumila* with violet flowers was discovered in 1970 in Selmun; the yellow flower-form, discovered by Ms. Patricia Wright in 1972, from Ras il-Pellegrin; and a large population found in 1976 consisting of both flower forms growing together at il-Qortin tal-

¹ 32 "Gardenia", triq il-Batterija, Santa Venera SVR1430 Email: info@maltawildplants.com

Magun, l/o Nadur, Gozo (Wayfarer, 1976). Michael Briffa (pers.comm., May 2008) also observed the violet flower forms at il-Fawwara tal-Wardija, l/o Mgarr in 1979 and later at Ghajn Hadid, l/o Selmun in 1993. Darrin T. Stevens (pers. comm., Oct-2008) communicated to the author the location of three other populations, while Steven Bonello (pers. comm., Feb-2007) recorded another population in Mosta. Four other populations were recorded by the author during the last two years, as indicated in the distribution list below.

Malta:

- [Violet form, Selmun, l/o Mellieha (1970, leg. unknown but reported by Wayfarer (1976))] !
- [Yellow form, Ras il-Pellegrin (Fomm ir-Rih), l/o Mgarr (1972, leg. Patricia Wright)] !
- [Violet form, Fawwara tal-Wardija, l/o San Pawl il-Bahar (1979, leg. Michael Briffa)]
- [Violet form, Ghajn Hadid, Selmun, l/o Mellieha (1993, leg. Michael Briffa)] !
- [Unknown colour form, Tal-Kortin, l/o San Pawl il-Bahar (2006) ⁴]
- [Violet form, Mosta fort, l/o Mosta (Feb-2007, leg. Steven Bonello)]
- [Yellow form, Ghajn Luta, Marfa l/o Mellieha (22-Apr-2007, leg. Stephen Mifsud) ²] *
- [Violet form, near Dingli Cliffs, Dingli (1-Nov-2007, leg. Stephen Mifsud)] *
- [Violet form, Bingemma l/o Mgarr (12-Mar-2008, leg. Stephen Mifsud)] *
- [Unknown colour form, Wied Musa, Marfa l/o Mellieha (4-Apr-2008, leg. Stephen Mifsud) ²] *

Gozo:

- [Intermixed violet and yellow forms, Il-Qortin tal-Magun, l/o Nadur (1976, leg. Mario Gauci) ¹] !
- [Intermixed violet and yellow forms, Il-Qortin il-Kbira, l/o Nadur (1976, leg. Mario Gauci) ¹] !
- [Unknown colour form, Ta' Ċenċ Area, l/o Sannat (1990s, leg. Shirley A. Micallef) ^{3,4}]

¹ Although Il-Qortin tal-Magun and Il-Qortin il-Kbira are two adjacent sites, they are regarded as one location on the distribution map, in view of their proximity (figure 1).

² Wied Musa and Ghajn Luta in Marfa are very close to each other and will be regarded as one location on the distribution map (figure 1).

³ Another population has been recently reported from Il-Qortin il-Kbir, close to Ta' Ċenċ, l/o Sannat, and this might be the same record of Shirley A. Micallef; further fieldwork is required to determine if there are two distinct populations in this area (Stevens D.T., pers. comm. Oct 2008).

⁴ Data provided by Stevens D.T. (pers. comm., Oct 2008)

* New records made by the author

New populations of *Iris pseudopumila* recorded in the present study

One of the new populations was found on the 1st of November 2007 at Had-Dingli - some 400m away from Dingli cliffs. It consisted of a patch of densely growing plants covering an area about 4m x 3m. The habitat was typified by xeric grassland and ermes species, and was rather rich in soil. This population was partially sheltered by *Opuntia ficus-indica* (L.) Miller and *Ceratonia siliqua* L. while other dominant flora that were recorded on the selfsame date includes the low-growing *Oxalis pes-caprae* L., *Bituminaria bituminosa* (L.) Stirton, *Silene colorata* Poiret, *Leontodon tuberosus* L., and a few specimens of *Ferula communis* L., and *Asphodelus aestivus* Brotero.

When this new population was observed in November, the plants were not yet in flower – however, the population was surmised to belong to the violet flower form in view of the leaf size and overall large size of the plants. The violet flower form was in fact confirmed on the 9th of February 2008 (Figure 2 - top). During this day, another smaller, violet-flowering population was found some 50m away (Figure 2 - bottom). It occupied an area of about 2m x 1m. The population of Dingli is, so far, the southernmost location of this species in the Maltese Islands.

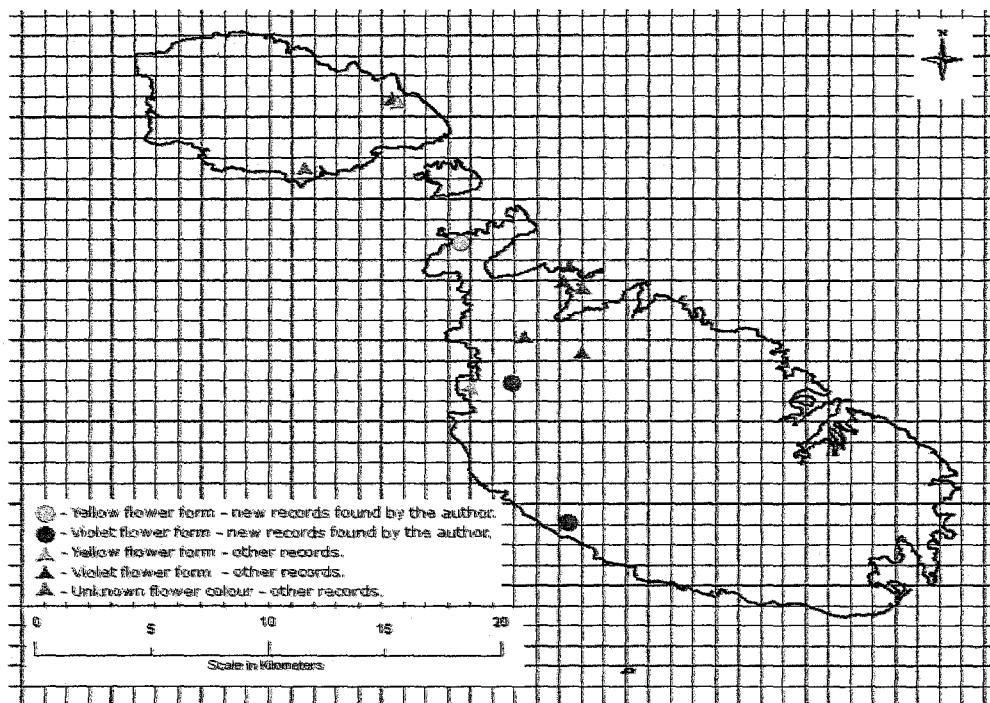


Figure 1. Distribution of *Iris pseudopumila* on the Maltese Islands (UTM, zone 33S, 1 km x 1 km grid).

Another population of *I. pseudopumila* was found in 3 different stations in the Marfa/Cirkewwa area. The largest population was reported from Ghajn Luta (Mifsud, 2007), but the plants were not in flower at the time. The author observed the plants in flower on 1st January 2008, and as he predicted from the small size of the leaves that the species belonged to the yellow-flower form. Two smaller populations were found on the 4th of April 2008: one was located about 200m WNW of this site (also part of Ghajn Luta) and it consisted of some 60 small plants over a small area of 2-3m across. The plants were small and had the same leaf-sizes as the other population of Ghajn Luta, and so it is assumed that they were also the yellow variety. The other population was about 700m Eastwards, more-or-less at the beginning of Wied Musa. This population was very small and occupied a narrow stretch of 4-5m long.

The author noticed that, unlike other known populations of *I. pseudopumila*, the distribution habit of the plants at Ghajn Luta was not in one dense clump but was scattered various densities, from individual specimens to small groups of three-ten plants. At four locations, larger and more denser patches were present (Figure 3). The habitat was an arid, unsheltered phrygana/labiate garigue with xeric grassland communities, situated on karstic rock of the Upper Coralline Limestone, with *Urginea panceration* (Steinheil) Philippe, *Atractylis gummifera* L. *Galactites tomentosa* Moench, *Anthyllis vulneraria* L., *Anthyllis hermanniae* L., *Fumana thymifolia* (L.) Webb, and *Thymus capitatus* L. The area of occupancy of the larger population of Ghajn Luta measured 14m x 9m, and is assumed to be the largest population of the yellow-flower form in the island of Malta. It is also only the third population on the

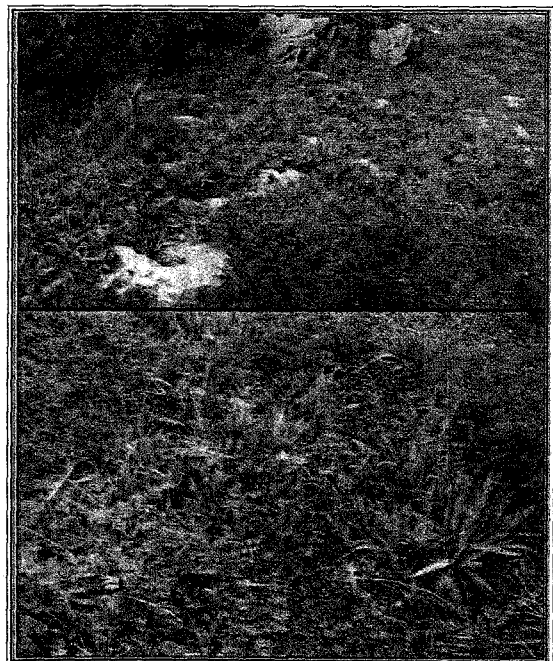


Figure 2. Two separate populations of *Iris pseudopumila* (violet flower form) from Dingli.

Maltese Islands, together with the smaller population at Ras il-Pellegrin (which is declining) and the larger population at Nadur, in the island of Gozo, where it is interspersed with specimens of the violet flower form.

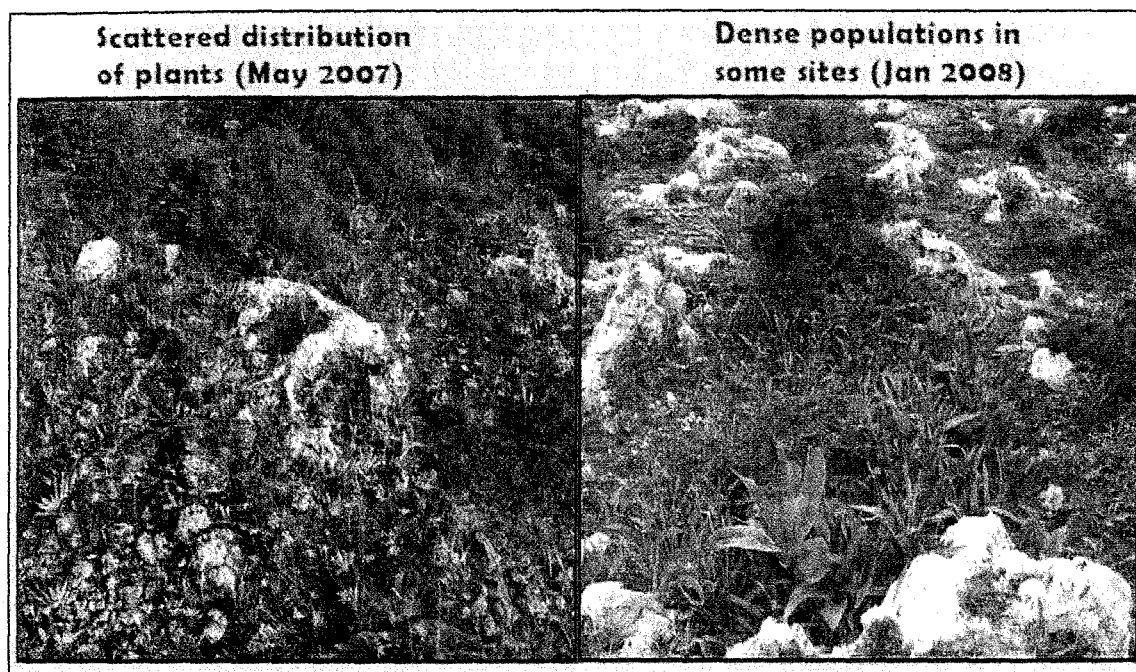


Figure 3. Populations of the yellow flower form of *Iris pseudopumila* in Marfa.

Another population of *I. pseudopumila* was found by the author in Dwejra, over the Victoria Lines on 12th March, 2008. This had violet flowers and was about 2mm across. The population was growing close to a British military construction and might have been transplanted from the nearby Fort Campbell, Selmun, which is an unused British military fortification.

Differences between the 3 yellow forms of *Iris pseudopumila*

On comparing the three populations of the yellow form, the author found some differences in the dark reddish-brown coloration of the down tepals. These differences are given in Table 1 and are illustrated in a composite image of photos in Figure 4.

Table 1. Comparison of the 3 yellow flower forms of <i>Iris pseudopumila</i> in Malta			
Characteristic of the maroon patch	Population at Fomm ir-Rih	Population at Ċirkewwa	Population at Nadur, Gozo
Intensity of colour	Relatively faint. Sub-diffused with the yellow colour of the tepal	Dark and well defined. Darker veins distinctly visible	Very dark, almost as dark as the veins, making the latter not distinctly visible.
Size	The patch reaches up to about 3 mm from the edge of the tepal leaving a distinct yellow border.	The patch reaches nearly the edge of the tepal, leaving a very narrow yellow outline (c. 1mm)	The patch reaches up to about 2mm from the edge of the tepal. Yellow border distinct

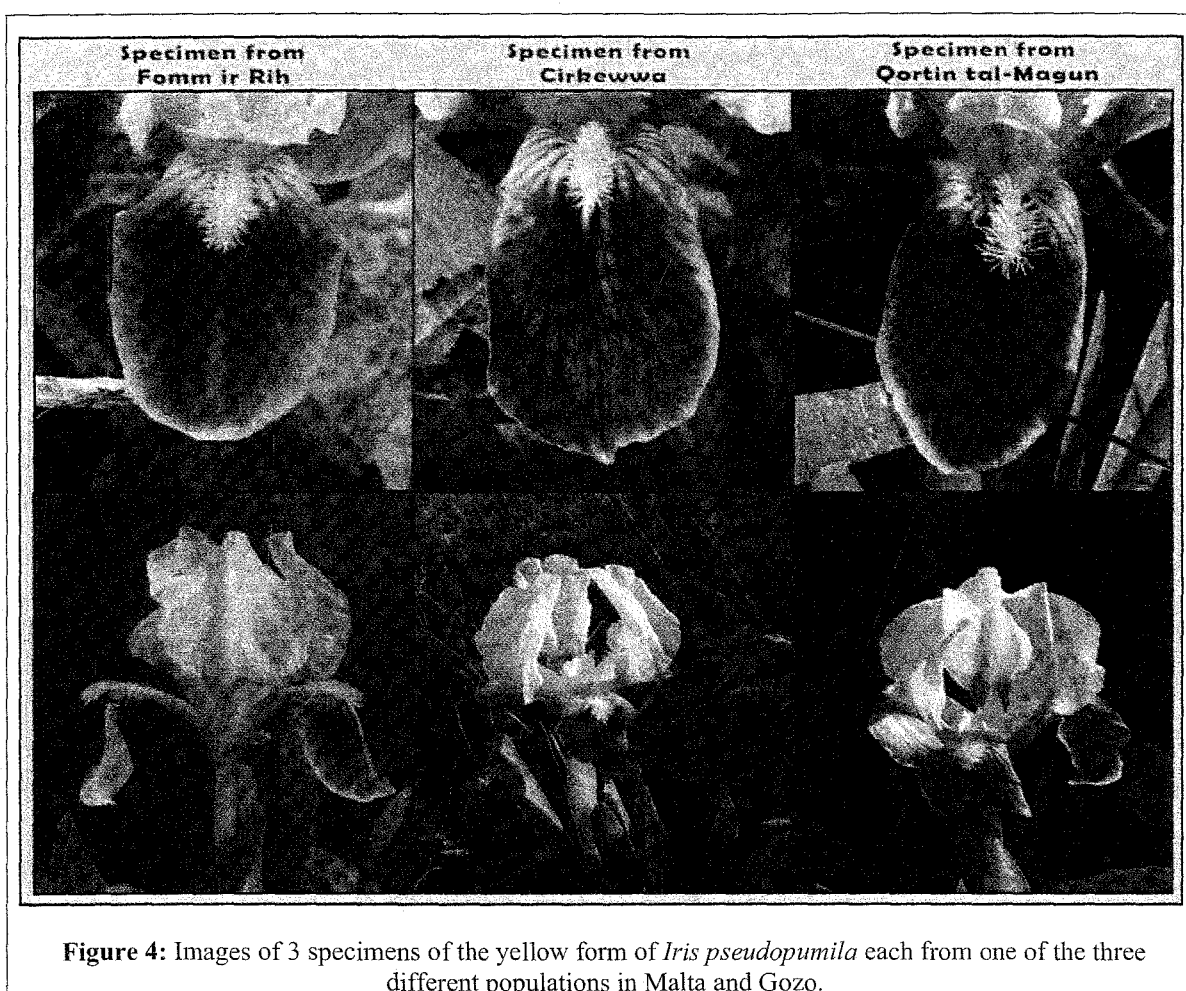


Figure 4: Images of 3 specimens of the yellow form of *Iris pseudopumila* each from one of the three different populations in Malta and Gozo.

The pattern of the maroon patch was in general consistently similar in the specimens of the corresponding population, though a certain degree of variation was observed in the large population of Nadur. The difference in the maroon coloration between the populations at Ras il-Pellegrin (Fomm ir-Rih) with those of the other 2 locations is quite marked. Owing to these differences, the populations are likely to originate from 3 separate races each stationed at the corresponding locations, hence not transplanted from a previous existing population.

Differences between the yellow and violet forms of *Iris pseudopumila*

The author has observed a number of differences between the yellow (or variegated, to be more precise) flower form and the violet flower form of *I. pseudopumila* in Malta. The main differences summarized in Table 2 were consistently found on specimens growing at Selmun (violet form), Dingli (violet form), Marfa (yellow form) and Nadur (both yellow and violet forms).

Table 2. Main differences between the violet and yellow form of *Iris psedopumila*.

Characteristic	Violet flower form	Yellow flower form
Size of the leaves.	Large; with the largest leaves reaching about 28cm long and 2.7cm wide. (See Table 3 for data)	Smaller; with the largest leaves reaching about 20cm in length and 2.1cm wide. (See Table 3 for data)
General Flower Size	Large; average length of standard is 7.2cm; average length from the tip of beard to the tip of the tepal is 4.1cm	Smaller; average length of standard is 5.5cm; average length from the tip of beard to the tip of the tepal is 2.5cm
Flower Fragrance	Average to mild, sweet-scented	Stronger scented, somehow different (more 'delicate') from the violet variety.
Flowering Time	End of Jan to mid Mar	Earlier, beg of Jan to end Feb

Due to the marked difference in the sizes of the leaves, one can distinguish with a relatively high level of confidence whether a population of *I. pseudopumila* is of the yellow or violet flower form during the non-flowering period. The criteria that the author uses is that if the larger leaves of a population are on average less than 21mm wide, then the plants correspond to the yellow form. The larger leaves of specimens of the violet form are often wider than 25mm. Measurement data of the width of the leaves of both varieties are given in Table 3 and were taken between November and January. This difference in leaf size is well illustrated in Figure 5. This difference was observed in all the *Iris* populations known to the author in Malta.



Figure 5. Largest leaves of the yellow form on the left side, and largest leaves of the violet form on the right side from an intermixed population of *Iris pseudopumila* in Gozo.

Pignatti (1982) gives a range of 15-35mm for the width of the leaves of *I. pseudopumila* and up to 20cm long. He does not give separate measurements for the leaves (or flowers) of the yellow or violet form, and hence, gives the impression that there are no marked differences between the two forms in Italy. More interestingly, Tutin *et al.* (1980) states that the width of the leaves of this species is up to 15mm!

Fiori (1923-1927), gives four different forms of *I. pseudopumila*, but these were based only on the colour of the flowers, not on other differences mentioned in Table 2. The forms given are:

- I. pseudopumila* f. *violacea* Parl. [1860] – perianth dark violet
- I. pseudopumila* f. *discolor* Fiori [1907] – perianth violet with yellow margins
- I. pseudopumila* f. *lutescens* Fiori [1907] – perianth cream-white
- I. pseudopumila* f. *lutea* Fiori [1907] – perianth purely yellow.

The two forms of the same species do not seem to hybridize in the intermixed populations at il-Qortin tal-Magun / Il-Qortin il-Kbira, and although specimens with yellow tepals with a violet border exist according to Pignatti (1982), these have not been observed at Nadur where the two forms co-occur. This, coupled with the differences indicate in Table 2 may imply that some differences might be taxonomically important, although further studies are required. In this respect, it should be noted that Service (1999) has recently described a new subspecies from the island of Gozo, namely *Iris pseudopumila* Tineo subsp. *gozoensis* N. Service, on the basis of plants found in the limits of Nadur. It is unclear if this is the same population located at Il-Qortin tal-Magun / Il-Qortin il-Kbira, where the two colour forms co-exist. Service (1999) also compared the Nadur plants with those in Italy and reported significant differences in the Gozitan population that fall beyond the variability of *I. pseudopumila* s.str.

This supposedly endemic subspecies is reported to differ from subsp. *pseudopumila* in having dark violet flowers, larger stems, leaves and flowers (c. 7.0cm diameter), a much larger ovary and shorter perianth tube. Service (1999) also states that while the Maltese plants (without giving locations) can be regarded as *I. pseudopumila* subsp. *Pseudopumila*. The irises of the population at Gozo “are very much larger and of a distinctive violet colouration”. Since this matter requires further investigation, this author is aiming to compare the forms of *I. pseudopumila* of Malta with those in Italian territories, so as to shed more light about the situation of the *Iris pseudopumila* in Malta and the Central Mediterranean region.

Status of *Iris pseudopumila* for the Maltese Islands

Lanfranco (1989) reports the species as a vulnerable with a restricted distribution in the Maltese Islands and the Mediterranean. On the basis of the IUCN Red List Categories and Criteria (IUCN, 2008) the species resulted being critically endangered in the Maltese Islands, with the following status: CR B1+2ab(iii), noting that the area of occupancy is less than 3km², with the extent of occurrence being less than 100km² (calculated to be 98km²).

The main threats to the species appear to be bird trapping sites, as evidenced by the considerable damage inflicted to part of the population of the yellow flower form at Il-Qortin tal-Magun (Gozo), which was destroyed by the clearing of an area to make space for a bird trapping site as shown in Figure 6. In this respect, it should be noted that the species is strictly protected in the Maltese Islands since 2003, particularly through the provisions of the Flora, Fauna and Natural Habitats Protection Regulations, 2006 (Legal Notice 311 of 2006), published through the Environment Protection Act and Development Planning Act.

Table 3. Measurement data of the width of the largest leaves of the yellow form and violet form of *Iris pseudopumila* from different populations for a comparison study between the two forms.

Variety: Population:	Yellow flower form		Violet flower form		
	Ċirkewwa	l/o Nadur	l/o Nadur	Dingli	Selmun
Measurements of 10 samples (mm)	22.0	22.5	25.5	24.0	29.0
	17.0	21.5	26.5	25.0	27.2
	18.0	19.5	27.0	24.5	25.5
	19.5	18.0	30.0	27.5	26.0
	22.0	18.5	27.5	24.0	28.0
	19.0	20.0	26.5	24.0	26.5
	20.0	21.5	25.0	28.5	24.5
	21.0	20.5	28.0	27.5	27.0
	20.5	19.0	30.5	28.0	29.5
	22.0	23.5	25.5	26.5	28.5
Sample size (n)	10	10	10	10	10
Largest value/mm	22.0	23.5	30.5	28.5	29.5
Lowest value/mm	20.3	18.0	25.0	24.0	24.0
Average/mm	20.10	20.45	27.20	25.95	27.17
Standard deviation	1.74	1.79	1.86	1.83	1.60

Methodology adopted: Plants in a population which had relatively large leaves were chosen for measurement. Measurements of 10 such plants randomly distributed in the population were taken. The widest part of the chosen leaf was measured by a ruler with 0.5mm resolution.



Figure 6. *Iris pseudopumila* was found growing around a clearing used as a trapping site at Qortin tal-Magun, Gozo (Jan 2008).

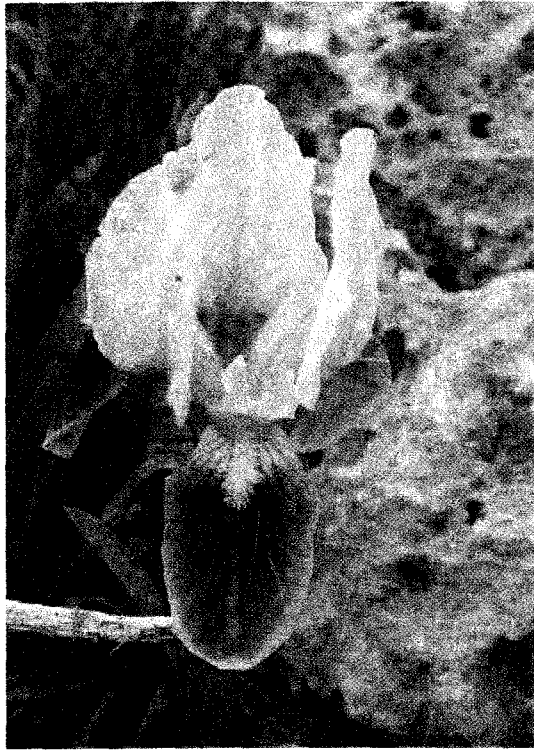


Figure 7. *Iris pseudopumila* from Ras il-Pellegrin, Malta



Figure 8. *Iris pseudopumila* from Ghajn Luta (Marfa), Malta

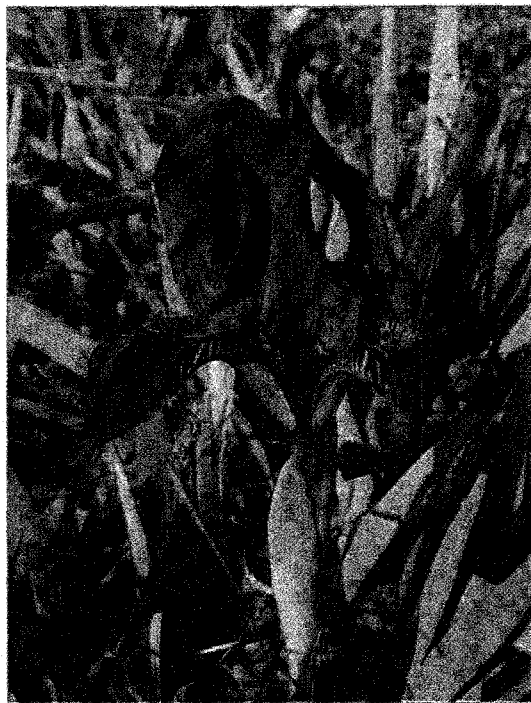


Figure 9. *Iris pseudopumila* from Dingli, Malta

ACKNOWLEDGEMENTS

The author would like to thank Mr. Michael Briffa and Mr. Steven Bonello for letting him mention their unpublished locations of *I. pseudopumila* in this article, and Mr. Darrin T. Stevens for providing other records of this species and supplying further information. The author is also grateful to the Environment Protection Directorate (EPD) of MEPA for assisting in this article, by issuing a permit to take some samples of this protected species for morphological analysis and special thanks to Miss Marie Therese Gambin (also from the EPD) for supplying documentation and further aid about the IUCN Red List Categories and Criteria (IUCN, 2008). Credit is also due to Mr. Mike Grant, current editor of 'The Plantsman' for providing the article of N. Service (1999).

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(Submitted: July 2008)

(Accepted: October 2008)

FOUR NEW RECORDS FOR THE FLORA OF THE MALTESE ISLANDS - *DACTYLOCTENIUM AEGYPTIUM* (L.) P.BEAUUV. (FAM. POACEAE), *AMARANTHUS MURICATUS* (GILLIES EX MOQ.) HIERON. (FAM. AMARANTHACEAE), *FUMARIA REUTERI* BOISS. (FAM. FUMARIACEAE) AND *SPIRODELA OLIGORRHIZA* (KURTZ) HEGELM. (FAM. LEMNACEAE)

Stephen MIFSUD¹

ABSTRACT

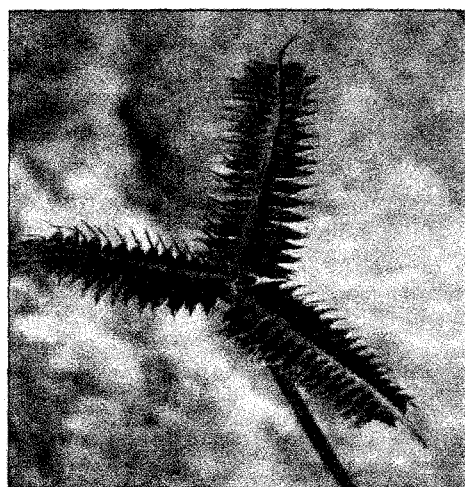
Four plant species are reported as new to the flora of the Maltese islands: *Dactyloctenium aegyptium* (L.) P.Beauv. (Family Poaceae), *Amaranthus muricatus* (Gillies ex Moq.) Hieron. (Family Amaranthaceae), *Fumaria reuteri* Boiss. (Family Fumariaceae) and *Spirodela oligorrhiza* (Kurtz) Hegelm. (Family Lemnaceae). The article gives worldwide distribution, plant characteristics and information on the location and habitat that they were found in. The article is complemented by several illustrations.

Keywords: *Dactyloctenium aegyptium*, *Amaranthus muricatus*, *Fumaria reuteri*, *Spirodela oligorrhiza*, Malta

Taxa cited in this article are listed according to the online and up-to-date database of the Flora Europaea hosted on the Royal Botanical Gardens Website. <http://rbg-web2.rbge.org.uk>

***Dactyloctenium aegyptium* (L.) P. Beauv.**

Ref: Agrost. 72, Expl. Pl. 10 (1812)



Dactyloctenium aegyptium (L.) P. Beauv. (= *Cynosurus aegypticus* L.) is a caespitose plant with geniculately ascending, or decumbent culms. The lamina of the slender leaves is glabrous, but the margin and ligule are conspicuously ciliate. It is easy to identify from its characteristic digitate inflorescences, hence the English name "crowfoot". It normally forms 3-6 spikes (racemes) spreading and radiating out from the top of the culm and hence forming a digitate arrangement. The 12-65 mm long, oblong-shaped racemes are composed of 2 rows of spikelets, perpendicular to and at each side of the common rachis. Each spikelet comprise 3 to 4 fertile florets about 3mm long each producing a set of 3 white anthers, less than 1mm long. The fruit is obovoid, rugose, 1mm in size and with a soft pericarp.

Figure 1: *Dactyloctenium aegyptium* (L.) Beauv. from Wied tax-Xlendi, Gozo, Malta

¹ 32 "Gardenia", triq il-Batterija, Santa Venera SVR1430 Email: info@maltawildplants.com

This low-growing grass species is known from warm tropical and sub-tropical regions of Africa and Asia (Tutin *et al.*, 1980 ; Pignatti, 1982; Holm *et al.*, 1977), where it occurs in at least 52 countries of this region (GRIN, 2002), including North Africa (Morocco, Algeria, Tunisia, Libya and Egypt). The latter territory is probably the source of origin in South Europe, were according to Tutin *et al.*, (1980) it is only found naturalised in Italy (Latium, Molise, Calabria, Sicily and Turin – Pignatti, 1982; Conti *et al.* 2005) and Crete. The species is the only member of *Dactyloctenium* in Europe (Tutin *et al.*, 1980). It is hence assumed that the populations found on the Maltese islands (Gozo) have been introduced, possibly originating from birds migrating from North African countries, since it is reported that some birds consume parts of *D. aegyptium* (L.) P. Beauv. (e.g. Swank, 1977, who found fruiting heads of the grass in the helmeted guinea-fowl in Kenya).

Four populations of this annual grass were found very close to each other in November 2007 at the south-facing side of Il-Wied tax-Xlendi, a valley situated at the SW coast of Gozo. All were found isolated in shallow temporary rock pools with thick layer of soil or in damp soil present in wide basins in the upper coralline limestone rock. The largest population was about 2 metres across. Plants were abundant and often carpeting most of the area of the rock basin that they were found in. This corresponds both with the fact that this species prefers moist places (Tutin *et al.*, 1980) and that it is considered as an invasive weed (Wagner *et al.*, 1997; Holm *et al.*, 1977). Accompanying species included *Scilla autumnalis* L., *Triglochin bulbosa* L. subsp. *laxiflora* Guss. (Rouy), *Plantago lagopus* L. and *Trifolium fragiferum* L.. Dominant species on the nearby rocky ground consisted of *Hypericum aegypticum* L., *Chiladenus bocconeii* Brullo, *Erica multiflora* L., *Adiantum capillus-veneris* L., *Asparagus aphyllus* L., *Capparis orientalis* Veillard and *Rhamnus oleoides* L.

The habitat of the plant is described to be rather variable and it seems to possess wide environmental adaptability. Habitats described for *D. aegyptium* include sand dunes, uncultivated and disturbed habitats near the coast, (Pignatti 1982, Holm *et al.*, 1977), arable land near the sea (Holm *et al.*, 1977), sandy soils (Holm *et al.*, 1977), on lava, along roadsides, and in other dry, exposed, disturbed areas in Hawaii (Wagner *et al.*, 1997) and also reported as a weed in many countries in the humid tropics (Holm *et al.*, 1977). FAO (2008), declares that this species is tolerant of alkaline soils, resistant to drought, adapted to a wide range of soil texture and is a quick-growing, short-term grazing plant which colonizes disturbed land.

The author found the plants only where considerable depth of soil was present, and did not observed any plants growing in rock crevices close to the site or disturbed ground with fertile soil located few hundreds of metres away from the locus of the populations. Despite the invasive characteristics of *D. aegyptium*, the plants were localised and limited to these few rock basins with damp soil. On the other hand, seed dispersal (Holm *et al.*, 1977) to other damp fertile soils - perhaps damp clay slopes near the coast or valley beds - could be a plausible future threat. Hence, subject to control measures, the species may extend its range in Malta, as is reported to have happened for the Mediterranean region (Tutin *et al.*, 1980).

***Amaranthus muricatus* (Gillies ex Moq.) Hieron**

Apunt. Hist. Nat. (Buenos Aires) 2: 92 (1910)

Amaranthus muricatus (= *Euloxus muricatus* Gillies ex Moq.) is a herbaceous, multi-branching, decumbent plant which forms numerous narrow elliptical leaves, unlike many *Amaranthus* species which form broad leaves. Inflorescence consists of terminal, compact pyramidal panicles (up to 4cm long) of inconspicuous tiny flowers with 5 tepals, the staminate ones with 5 stamens while the pistillate with 3 stigmas. In the fruiting stage the rachis of the inflorescence becomes very long and somewhat curved and as a result the small, hard, knob-like fruit becomes well spaced out from each other. The indehiscent fruit bears tiny black seeds about 1mm in diameter and lenticular in shape.

A. muricatus is commonly known as the African Amaranth, but the name is a misnomer since it originates from South America (Bolivia, Paraguay, Uruguay and Argentina: GRIN, 2002). It is reported to be naturalised in SE USA, SE Australia, SW Europe (GRIN, 2002; GBIF, 2008) and NW Africa (GBIF, 2008). Pignatti (1982), Conti *et al.* (2005) GBIF (2008) and MCL (2008) report this species in the following Mediterranean countries: Portugal, Spain (including the Balearic Islands), Morocco, France, South England, Italy (including Sicily and Sardinia) and Greece. Pignatti (1982) considers the species as a casual alien for Sicily. The species is essentially regarded as a ruderal species, e.g. in Spain it is reported from 24 different provinces as a ruderal of nitrophylic communities (Alvarez, 2001).



Figure 2: *Amaranthus muricatus* (Gillies ex Moq.) Hieron on disturbed ground at Mriehel, Malta

Few specimens of *Amaranthus muricatus* (Gillies ex Moq.) Hieron were found in Malta in November 2007 lying on disturbed ground at the Industrial Estate of Mriehel. The area was surrounded by ruderal species, the most abundant of which being *Diplotaxis tenuifolia* (L.) DC, *Foeniculum vulgare* L., *Dittrichia viscosa* (L.) Greuter and some specimens of *Ecballium elaterium* (L.) A. Richard and *Piptatherum miliaceum* (L.) Cosson. Plants exhibited themselves as a low mat of about 1 metre across consisting of dark green leaves, giving the first impression of a population of many plantlets, but close examination revealed a couple of large, highly-branched, procumbent plants. Two smaller populations of this herbaceous, short-living, perennial species were found at the same locality in May 2008; one growing on disturbed ground some 40m away from the population found in November, and another about 200m away, also on disturbed ground in an abandoned field, with other ruderal species. On the 3rd of October 2008, the site was revisited, and one of the smaller populations was not found (the site was cleared), while the other two had increased significantly in size. For instance, the population found in November 2007 had increased markedly and its area of occupancy was more than 2m across.

As for the Sicilian record, it is likely that *Amaranthus muricatus* has been introduced in Malta during the last third of the 20th century. This taxon is not mentioned in the old floras such as that by Borg (1927) or Haslam *et al.* (1977), although it might have been overlooked. The plant is considered a casual alien for Malta, but the species might become naturalised, as happened in Spain, since Malta also offers the warm climate that the plant prefers (Alavarez, 2001). Pignatti (1982) states that it was recorded only from Palermo (region of Sicily) in 1967, but few decades later, Conti *et al.* (2005), while confirming the Sicilian record, adds records from the regions of Molise, Calabria and Sardinia. The fact that within a short time the plant has shown up in three different regions in Italy reflects the spreading potential of this species. In view of this, more time is required to assess the invasiveness of this species for the Maltese islands. Based on reports from other Mediterranean regions, the tendency is for the plant to become naturalised as a ruderal of nitrophylic communities. Consequently, its invasive potential should not be underestimated.

***Fumaria reuteri* Boiss.**

Diagn. Pl. Or. Nov. 2(8): 13 (1849)

Fumaria reuteri Boiss. (= *F. apiculata* Lange; *F. transiens* P.D.Sell; *F. martinii* Clavaud), also known as It is known as Martin's Ramping-fumitory, is distributed in Spain, Portugal (Tutin *et al.*, 1993; GBIF, 2008; EFBI, 2008), Italy (Pignatti, 1982), South England (GBIF, 2008; Stace, 2008; EFBI, 2008), France (Alvarez, 2001; EFBI, 2008), South England (GBIF, 2008; Stace, 2008; EFBI, 2008), and is an introduced species in the state of Washington, USA (USDA, 2008). According to MCL (2008), it is native to France, Spain and Portugal, but not to the Mediterranean region, although Stace (2008) also reports it as native to the United Kingdom (South England) and its adjacent island territories (including the Scillies, Isle of Wright and Channel Isles).

Despite such distribution, this plant is reported as native to Northwest Europe, but not to the Mediterranean region (MCL, 2008). As such, *Fumaria reuteri* is considered as a possible introduction to Malta, perhaps through horticultural imports or tourist traffic. However, the date of introduction is difficult to determine, considering the close resemblance between different *Fumaria* species. Alvarez (2001) describes the species as a variable plant, often found in cultivated land and roadsides, and that is not a ruderal, while on a similar note, Wilson *et al.* (2003), states that the plant in UK is found growing in arable fields, hedge bottoms and allotments.

Fumaria reuteri was discovered in Malta at Santa Venera (l/o Qormi) in December 2007, and was found growing in abandoned fields and margins of fields cultivated with wheat. Accompanying vegetation included *Oxalis pes-caprae* L., *Borago officinalis* L., *Glebionis coronaria* (L.) Cass. ex Spach, and other species typical of ruderal areas. In January 2008, it was frequently found in urban areas close the location of first discovery, particularly in pavement crevices and private gardens. In April 2008 a large population was found in a public area close to the Primary School of Żebbuġ, Gozo, indicating that the species is possibly overlooked, and has a wider distribution in the Maltese islands.

This is possibly explained since the genus *Fumaria* L. comprises many species whose identification often depends on minute morphological details, where, for instance, a difference of 1-2mm in the fruit or sepals can be significant for the identification of the species (Pignatti, 1982; Tutin, 1993; Álvarez, 2001). Additionally several species are quite variable and a number of specimens should be examined. When assessing the plants observed, the author could not place this taxon within any of the recorded *Fumaria* species in the Maltese islands; although these plants looked somewhat like *Fumaria muralis*, there were several features that did not match the descriptions of this species, most noticeably being the fact that the raceme was always longer than the peduncle and the sepals were subentire and more than 3mm long.

The author followed 3 different identification keys and all led to *Fumaria reuteri*. Since as mentioned, species of the genus *Fumaria* are quite controversial and difficult in their identification, the author is giving the process of his identification extracted from the 3 different keys of identification:

A) According to Pignatti (1982), *Fumaria reuteri* Boiss. (= *F. transiens*) keys out as follows:

1. Sepals longer than 1mm
2. Corolla longer than 9mm
3. Pedicels patent or erect
4. Fruit 2.0-2.5mm diameter
5. Sepals 3-5mm
- 6a. Sepals subentire, flowers occupy $\frac{3}{4}$ of peduncle = *F. reuteri*
- 6b. Sepals dentate, flowers occupy $\frac{2}{5}$ – $\frac{3}{5}$ of peduncle = *F. muralis*

B) According to Tutin *et al.* (1993), *Fumaria reuteri* Boiss. keys out as follows:

1. Corolla at least 9mm
2. Sepals not more than 3mm wide
3. Fruit not more than 3mm wide
4. Sepals more than 2mm wide
5. Fruit smooth (not rugose)
6. Raceme longer than peduncle
7. Sepals 3.0-4.5 long
8. Sepals subentire
9. Corolla less than 11mm long
- 10a. Sepals 3mm long = *Fumaria muralis*
- 10b. Sepals 3.5 – 4.5mm long = *Fumaria reuteri*

C) According to Álvarez (2001), *Fumaria reuteri* Boiss. keys out as follows:

1. Flower more than 9mm
2. Fruiting pedicels erect
3. Tip of upper petal darker from rest
4. Sepals longer from 3mm
5. Fruit less than 2.5mm
6. Peduncles shorter than raceme
7. Sepals sub-entire, longer from 3mm
8. Bract shorter from pedicel

All these morphological features were found in the specimen under examination as demonstrated in Figure 3, where parts of the plant were photographed against a metric graph paper where each box corresponds to 2mm x 2mm.

Species similar to *Fumaria reuteri* found in the Maltese Islands include *Fumaria bastardii* Boreau (the Tall Ramping-fumitory), which has slightly smaller flowers and whose sepals are less than 3mm with a more dentate margin; and *Fumaria muralis* Sond. ex W.D.J.Koch (Common Ramping-fumitory), which has racemes which are shorter than the peduncles.

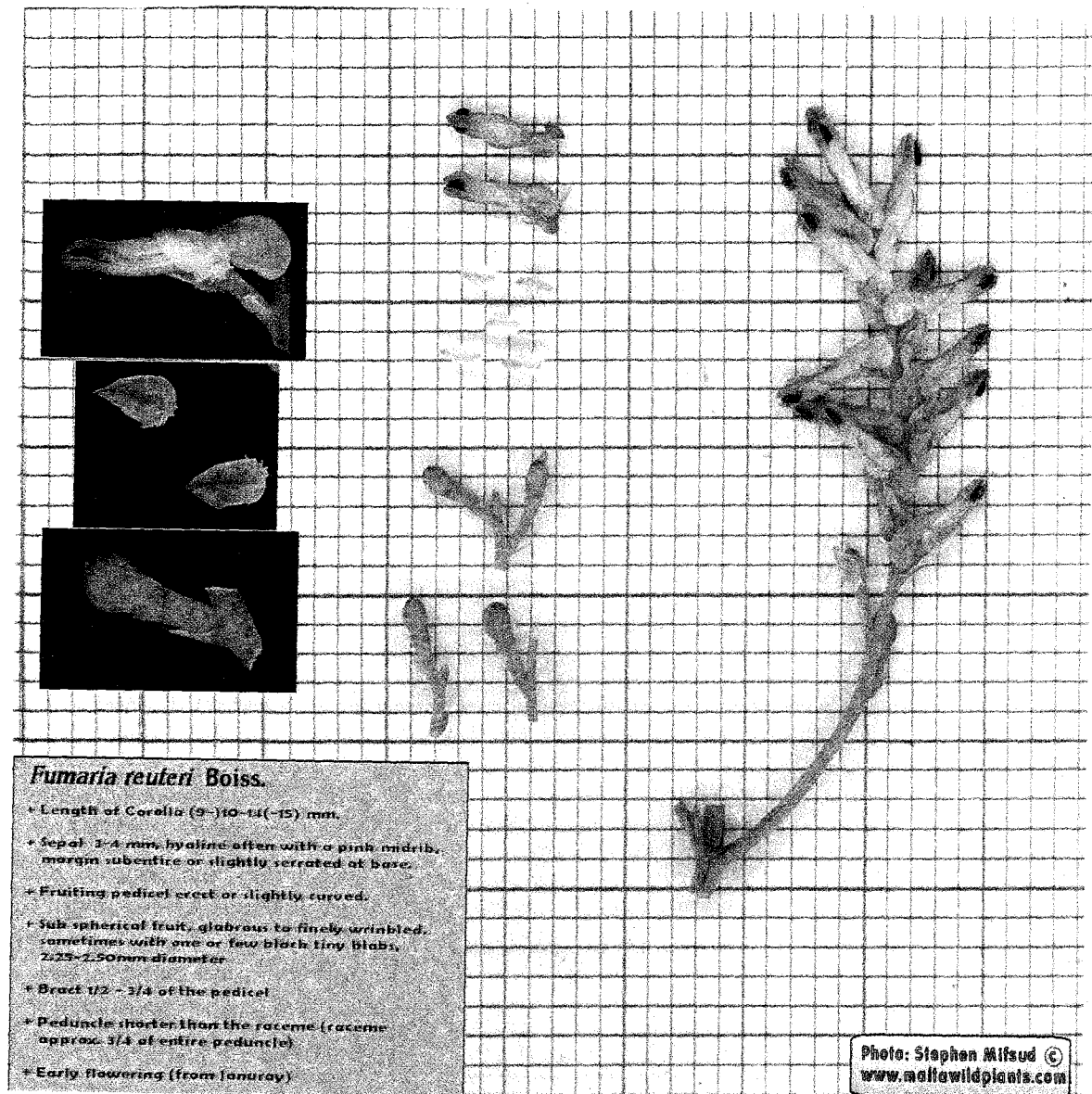


Figure 3: Specimen of *Fumaria reuteri* Boiss. against a metric paper. Each small box corresponds to 2mm.

***Spirodela oligorrhiza* (Kurz) Hegelm.**

Lemnac. 147 (1868)

Two species of the family Lemnaceae have been reported to date in the old floras of Malta, namely *Lemna minor* L. (Grech Delicata, 1853), Borg, 1927; Haslam *et al.*, 1977) and *Wolffia arrhiza* (L.) Hork. Ex Wimmer (Haslam *et al.*, 1977). More recently, Weber & Kendzior (2006) have reported the occurrence of *Spirodela polyrrhiza* (L.) Schleid. (= *Lemna polyrrhiza* L.) as the third species of Lemnaceae in Malta. Studies are ongoing on this group, since other Lemnaceae are known from the Maltese Islands. Additionally, since the importation of aquarium and horticulture products has increased considerably in the last decades, the risk of introductions has also increased.

A fourth species, *Spirodela oligorrhiza* (Kurz) Hegelm. (= *Lemna oligorrhiza* Kurz), was recorded by the author in three stagnant water ponds situated along the valley bed of Wied Sara and inside one large dam in the valley called Il-Wied ta' l-Ort (continuation with the valley of Wied Sara) in Gozo. These populations were observed in

April 2008 and all consisted of large numbers of specimens clumped together and covering almost the entire water surface of the ponds and a considerable area of the dam.

Other aquatic plants, such as species of Lemnaceae or *Ranunculus*, were not observed on this survey date, but a semi-aquatic, indeterminate *Persicaria* species, already known from the area, was present in 2 of the 4 sites described. From these observations, it can be concluded that *Spirodela oligorrhiza* is a fast-reproducing and locally invasive aquatic species of stagnant or slow moving water.

The specimens initially looked similar in habit to *Lemna minor*, but after a closer examination, several roots were observed growing from the underside of each frond (vegetative, leaf-like body), in contrast with *Lemna* spp., which always have one root only (Pignatti, 1982). Additionally, the lower surface was reddish-mauve in colour, unlike the green one of *Lemna minor* (FNA, 2004).

The specimen was further identified as *S. oligorrhiza* and not the closely related *S. polyrrhiza* by having 2-4 roots (unlike 5-10 roots in *S. polyrrhiza*) and fronds measuring 3-5mm across, smaller from those of *S. polyrrhiza* which measures nearly a centimetre. (Pignatti, 1982). Other distinctive features between the two *Spirodela* species are the number of veins at the upper surface of the frond: in *S. polyrrhiza* there are at least 7 distinct veins, while in *S. oligorrhiza* 3-5 only (Pignatti, 1982). Moreover, *S. polyrrhiza* often possess a reddish/brown spot at the centre of the upper face of the frond, which is not found in *S. oligorrhiza*. (FNA, 2004).

Spirodela oligorrhiza is an aquatic plant found in many southern states of North America; South America; Asia, Africa, Atlantic Islands; Pacific Islands and Australia (FNA, 2004). Tutin *et al.* (1980) adds horticultural gardens of Calcutta, India but does not give any reference to European stations. Distribution in Europe seems to be restricted to Italy and is given by Pignatti (1982) as a new species ("ic nova") in the region of Lombardy. The same and only Italian region was also given for *S. oligorrhiza* some decades later by Conti (2005). From the distribution given above, *Spirodela oligorrhiza* is likely to be an alien species in the Maltese Islands and possibly the rest of Europe. If this is the case, the source of introduction in the Maltese islands remains unclear for this species, but Lemnaceae species are often sought by aquarium hobbyists.



Figure 4: *Spirodela oligorrhiza* (Kurz) Hegelm. with 2-4 roots per frond and a mauve underside.



Figure 5: *Dactyloctenium aegyptium* (L.) Beauv. – new taxon for the Maltese Islands.



Figure 6: Fruit of *Amaranthus muricatus* (Gillies ex Moq.) Hieron. – new taxon for the Maltese Islands.



Figure 7: Flowering spike of *Amaranthus muricatus* (Gillies ex Moq.) Hieron. – new taxon for the Maltese Islands.

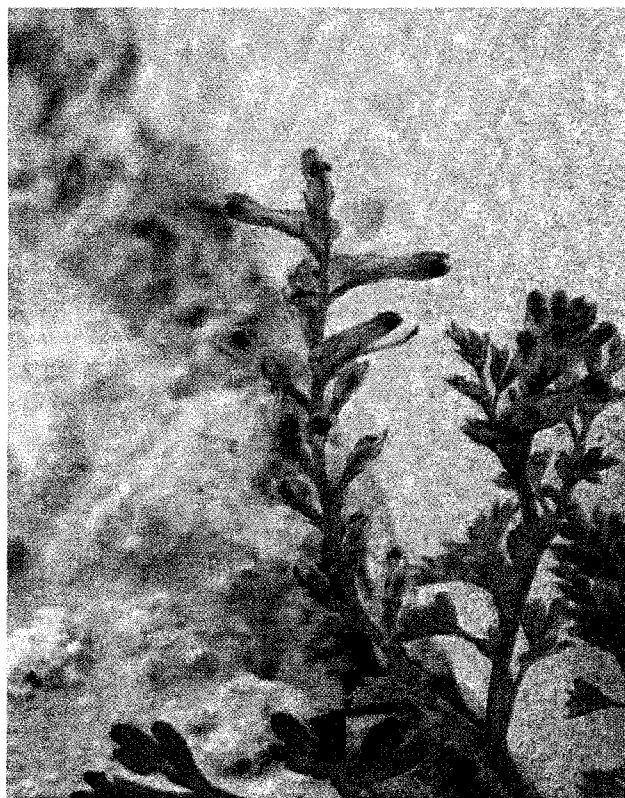


Figure 8: *Fumaria reuteri* Boiss. - new taxon from the Maltese Islands.



Figure 9: *Spirodela oligorrhiza* (Kurz) Hegelm. - new taxon from the Maltese Islands

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A CONTRIBUTION TO THE KNOWLEDGE OF ODONATA IN THE MALTESE ISLANDS

Arnold SCIBERRAS¹

ABSTRACT

The present work aims to contribute to and compare existing knowledge on Odonata species occurring in the Maltese Islands by providing additional records collected between the years 2000-2008.

Keywords: Odonata, Maltese Islands

INTRODUCTION

Very limited work has been published to date concerning Maltese Odonata, with basically all literature comprised of a handful of papers. The first Maltese records date back to 1899, by R. McLachlan, in which the first three Odonata species were recorded locally. The same species were mentioned again by J. Cowley in 1940, when he published a list of the Odonata of the eastern Mediterranean area. A. Valletta in 1949 recorded six species and in 1957 the same author recorded another two species. The latter two papers list the species inhabiting the Islands, and also provide some information about their distribution, together with minimal behavioural observations. Since then, little has been published, mostly in the form of popular articles or a revision of the local Odonata list. In 2008, M.J.Ebejer, G. Degabriele and the author published an annotated checklist of Maltese Odonata, listing four new species for the Islands and an update of records including the observations, flight season data and reasons for the recent increase in the number of species. In the same year, G. Degabriele published an annotated catalogue of the Odonata collection of G. Lanfranco, perhaps some of the oldest preserved Odonata specimens still available in local Maltese collections, now housed at the Natural History Museum. The author of the present study and M. Sammut also documented records of a new vagrant species to the islands in a separate work published in this same issue of the Central Mediterranean Naturalist.

All the above mentioned work was more focused in listing species. Thanks to the latter, the local species is now comprised of sixteen species. The following works are those which focused more on behavioural aspects. A. Valletta in 1951, J. Sultana and P. J. Schembri in 1991, and the present author, J. Sciberras and D. Magro in 2007. The latter two works documented migration of a number of Odonata species, although J. Sultana and P. J. Schembri did not give specific names of the species encountered. G. Degabriele in 1992 laid the preliminary foundations for the behavioural and ecological study of local Odonata, with very useful observations being made in his B.Ed. dissertation. In 2008, M. Balzan published a note on the distribution of two previously recorded Odonata species, as part of a thesis related to local Odonata, but this work was not available at the time of writing of the present paper. The most comprehensive work to date on global Odonata ecology is that of P.S. Corbet (1999).

¹ 131 'Arnest', Arcade Str, Paola – bioislets@gmail.com

AIMS AND METHODOLOGY

The present work aims to supplement existing information on knowledge of Odonata species occurring in the Maltese Islands. All records have been dated by the author between the years 2000-2008. Most Odonata behaviour mentioned in this work tally with those in Corbet's work (1999). In one of his chapters, Corbet indicates the main points of interactions of Odonata with other taxa and the Odonata families involved in such interactions.

All observations listed in this paper are from field observations, unless otherwise indicated. Many Odonata species were easily observed at close range or by means of a pair of binoculars. Some were also marked on the hind wing by a permanent marker to follow behavioural patterns of the same individuals, as well as recording flying and other locomotion patterns. Considerations about age expectancy were also made. All markings on the hind wings of individuals were made just after observation time, so that the individuals would be undisturbed during observations on their flight behaviour. After all relevant data had been recorded, individuals were caught and marked as follows: the hind wing was placed on a solid surface and marked with the initials of genus, species, sex and specimen number as shown in Figure 1.

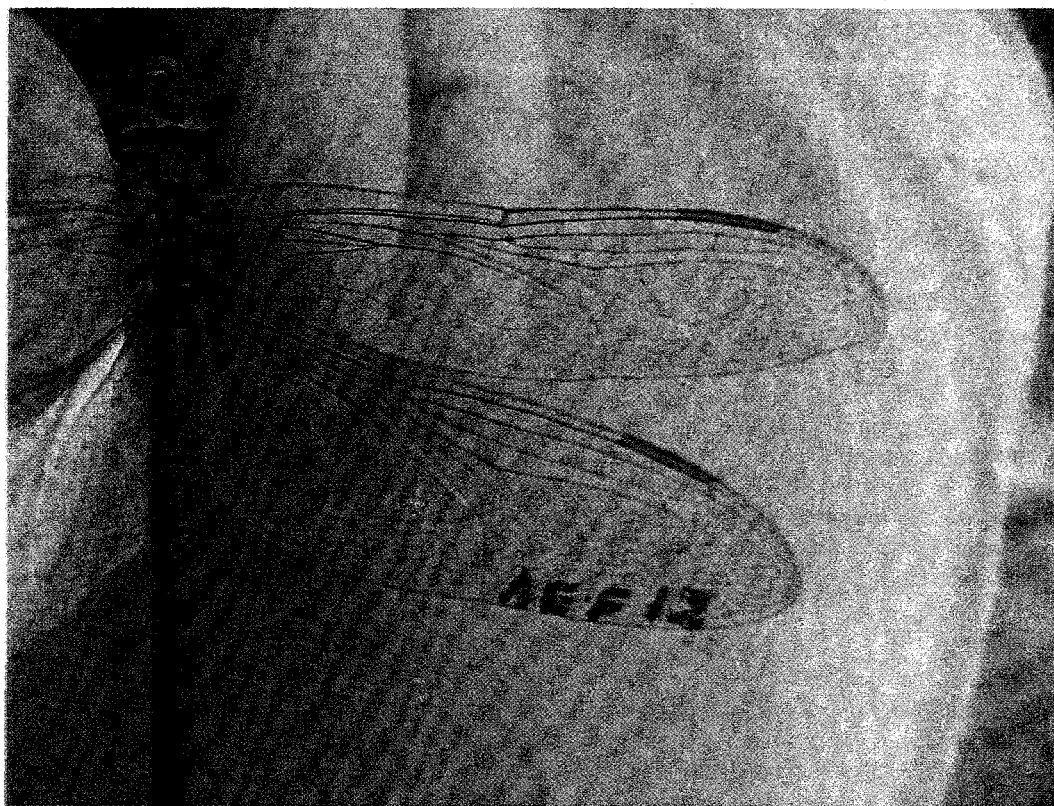


Figure 1: *Anax ephippiger*, retrapped after 22 days (photo credits: Arnold Sciberras).

RESULTS

ZYGOPTERA

Calopterygidea (Leach, 1815)

Calopteryx virgo (Linnaeus, 1758)

Although three local previous records of this species exist, only Sammut's record is considered reliable. All specimens belonged to the subspecies *meridionalis* (Sciberras & Sammut 2008).

Coenagrionidae (Charpentier, 1840)

Ischnura genei (Rambur, 1842)

Notes on behaviour

One of the first three arthropod species to be recorded locally (McLachlan, 1899), the latter species is still widespread and common, being denser in certain ponds in Malta. In Gozo, it is far less widespread, and although Comino holds five distinct records, it is not considered to be established on the island. One record of this species from Comino arrived from Cirkewwa, while the other two were from Ghajnsielem. No exuviae were found on Comino. Specimens that seem to be inhabiting water bodies close to shore tend to cross our islands as specimens from Cirkewwa were found at Ghajnsielem pond, and also at Nadur. All specimens that were re-trapped far from the water bodies, where they were originally caught, were all males. One of these specimens was marked in 6.v.2003 at Mistra on an artificial reservoir and on 8.v.2003 it was caught from a pond in Nadur. Other indications that show that this species is highly mobile, more than was previously thought, is that, both the specimens and their remains were found far from their original water bodies, and sometimes even encountered on the satellite islets of the Maltese archipelago.

At Ghajnsielem pool in May 2006, approximately eighteen specimens of this species were observed gathering on a branch a few centimetres under a perching *Alcedo atthis*. The bird was observed diving for *Gambusia* sp several times, and it is suggested that the damselflies were gathering there for the water droplets that the *Alcedo atthis* was releasing from its feathers when fluttering on the perch every time it comes up again and finished its meal.

In Gozo, the author to date only observed the dark green form females. From one hundred and five marked specimens only nineteen were re-trapped. The longest time frame of a specimen being re-trapped was of eleven days.

Feeding

This species was locally observed feeding on *Psychoda* sp, *Musca domestica* and other unidentified species of diptera. Generally prey has to be close by for this species to attack it, very unlike most other local Odonata, so most probably all this travelling is in search of a mate and new water bodies, rather than targeting its prey.

Predation

Locally this species was observed being preyed upon by the following avifauna. *Passer hispaniolensis*, *Sylvia melanocephala*, *Sylvia conspicillata*, *Cisticola juncidis*, *Hirundo rustica*, *Delichon urbica*, *Apus apus*, *Merops apiaster*. *Chameleo chameleo* and *Discoglossus pictus* were also observed preying on the latter. When *Ischnura genei* was more abundant at Sarraflu pool, *Pelophylax bedriagae* was recorded preying extensively on it. This Odonata species was also observed at il-Maghluq in Marsascala, being predated by *Mugil cephalus* and *Argiope* sp

(Degabriele 1992). The endemic populations of *Podarcis filfolensis* present on tal-Halfa Rock, Fungus Rock and Large Blue Lagoon Rock, were recorded feeding on this species, as evidenced by some pieces of wing where collected from their faeces. This is very interesting because these lizards are isolated populations and due to their restricted habitat they attempt to prey on a larger range of insect species. In fact, *Ischnura genei* is not recorded as a prey species for mainland lizards.

Copulation and Larvae

From fifteen observed mating patterns followed by copulations of this species, four of these were cannibalistic behaviours, observed taking place in the large rock pool at Ghajsielem. On two occasions during the fight for territory, one male took hold of the other male from the prothorax and started chewing it till it was completely devoured. On another two occasions, while the latter took place, the female joined in and aided in devouring the abdomen of the present victim. Later copulation took place and in most cases if continued being observed, the male will guard the female during deposition of eggs but do not hold in tandem during oviposition. Larvae and exuviae were also found to occur in brackish water at il-Maghluq, Marsascala in 1992 by G. Degabriele. A similar case was observed in Simar Nature Reserve by the author in 2005-2007.

ANISOPTERA

Aeshnidae (Fabricius, 1775)

Aeshna mixta (Latreille, 1805)

Only 1 female specimen recorded locally in 1976 is known to date by Ebejer (Ebejer *et al.* 2008.)

Anax (leach, 1815)

Anax ephippiger (Burmeister, 1839)

Notes on Local Behaviour

First recorded locally by Valletta in 1949, this species is a regular migrant in the Maltese islands and although from the 1950's it was recorded with gaps of up to two decades from each migration, from 2000 to the present this species has reached our islands every year, with the exception of 2006. During the 19th-25th April 2007 period, the largest migration observed locally in the last decade of this species was recorded (there are no previous records of this species older than ten years) due to the fact that hundreds of specimens were observed flying towards Zurrieq and Qrendi from Wied Babu. These continued spreading to many localities including Il-Maqluba and many of these specimens performed interesting hunting patterns feeding exclusively on *Culicidae sp* and other Diptera followed by other insects smaller than themselves.

Many at the same time were hovering in the same direction facing the light breeze and swiftly darting down on the prey, always keeping it's head facing in the opposite direction to the sun. Some other short observations showed that each batch of insects contained approximately twelve insects. These were flying in a certain pattern, where there was one male in front followed by ten females and another male following the rest. The same spectacular scenes were observed at Dwejra and at Ta' Cenc, Gozo, in the evening where hundreds of these specimens were resting on trees and shrubs as the sun was about to set (Sciberras *et al.* 2007). Two marked specimens from Ta' Cenc recorded on the 20th of April 2007 were recollected from Dwejra on the same day and twenty-two days later from Gharb. Out of thirty-four marked specimens, only the present two were retrapped.

Feeding

This species was locally observed feeding extensively on several species of Diptera most of which could not be identified. Out of these *Limonia nubeculosa*, *Culex pipiens*, *Bibio siculus* and *Cerdistus sp*, were present. Extracts

from the abdomens were taken and besides the species mentioned here, the latter also contained traces of *Formicidae* sp.

Predation

One specimen of this species was captured by *Manticola solitarius* in the mentioned migration (2007) and three specimens from a group of twenty-one were caught by a pair of nesting *Sturnus vulgaris* on Comino in 2005.

Copulation

Ebejer observed several specimens mating and ovipositing at Fiddien, Wied Ghomor and Simar. In addition, Degabriele observed pairs in tandem but no nymphs or exuviae were ever recorded, such that one cannot establish conclusively whether the species is breeding locally or not (Ebejer *et al.* 2008).

Anax imperator (Leach, 1815)

Notes on Local Behaviour.

First recorded locally by Valletta in 1949, this species is the largest found locally, and according to previous local literature, it was always stated as frequent to very common, giving the impression of being the commonest of the aeshnids. This could be either due to the fact that truly *Anax imperator* was much common in the past or it was misidentified as *Anax parthenope*, which is another locally-occurring species. Local tracking of the specimens show that although this species is widespread and travels great distances in search of food, most of them tend to head back frequently to the same water body either for ovipositing, sometimes guarding for their territory, and usually as a night resting place. Most of the present study was conducted at Chadwick lakes, and hence the name, this valley usually has a deep-water body when compared to other valleys, but still, like all valleys on the islands, most of it dries up due to the summer heat. This is an ideal and preferred habitat of this species. Out of thirty-one marked specimens, seven were traced regularly, and one specimen from here was recorded thirteen days after being marked at Wied is-Sewda and eight days later at the same spot where it was originally marked. From 2005 to date, out of four hundred and fifty captured and marked *Anax* individuals, just fifty-three belonged to the species *A. imperator*, with the rest belonging to the species *A. parthenope*.

The same specimens tend to spend the night on the same branches high up in trees (in this case *Populus alba*) and one specimen was recorded daily for four days as the sun was about to set, finding the same branch and resting on it. While patrolling or on the hunt, other species of Odonata do not seem to interfere, except for *Anax parthenope*. When *Anax imperator* and *Anax parthenope* individuals encounter each other, chasing usually take place, but tangled fights rarely occur, as in most cases within the same species. Sometimes, size issues may also render identifying the species a difficult task – for example, during or after the early emergence from the exuviae (due to drying up of water bodies) *Anax imperator* specimens may be much smaller in size and sometimes are even smaller than *Anax parthenope* specimens. Females of both these species sometimes look alike, because with age colour varies, especially after females of this species have oviposited or in above-average summer temperatures, so it is best that specimens are trapped and the two tubercles on the occiput of the female are actually located, as these are only present in the female of *Anax parthenope*. Females of more than thirty-five days old tend to start having their wings dampening, becoming tinted to a dark yellowish colour, but never dark brown like that of an old female *Anax parthenope*. The longest timeframe over which a female specimen was re-trapped is seventy six days, whilst a male individual of the same species was re-captured ninety-three days later. Most Odonata species tend to coexist, with locally the commonest species being *Crocothemis erythraea*, *Orthetrum coerulescens* and *Trithemis annulata*.

Feeding

This species was observed locally feeding extensively on several species of Diptera, most of which could not be identified. Out of these, *Bibio siculus*, *Calliphora vicina*, *Culex pipiens*, *Lucilia sericata* and *Sarcophaga fertoni*

were present. Lepidoptera in this species diet varies from *Pyrallis farinalis*, *Blepharita deluccai* to *Colias crocea*, *Pieris rapae* and *Pieris brassicae*. On separate occasions, a specimen of this species was observed hunting a *Sphingonotus coeruleus* and in another case a specimen successfully caught and lifted a *Mantis religiosa* nymph of the 3rd instar.

Predation

Locally, this species was observed being preyed upon by the avifauna species *Merops apiaster* and *Lanius senator*. *Chameleo chameleon* was observed twice at Ghadira nature reserve feeding on this species. *Anax imperator* was previously more abundant at Ta' Sarraflu freshwater pool, where large females of the frog species *Pelophylax bedriagae* were recorded preying occasionally on it.

Copulation and exuviae

Whilst the unusual (when compared with other aeshnid species) solitary oviposition by females of this species has already been recorded, the persistence on the same branch as the ovipositing female of a male (of the same species) is a rare event. Females were both observed laying their eggs by dipping their abdomen in flight and resting on generally large debris. In 2006, an interesting copulation was observed between a male of this species and a female *Anax parthenope*; the latter specimen was later disturbed in an attempt to gather the ova and the female did lay eggs in captivity two days later but these never hatched. No individual was ever collected in the present study which might suggest the occurrence of hybridisation. This species was also observed ovipositing in brackish water. Moreover, the exuviae of this species were observed clinging to reeds by Degabriele in 1992.

Anax parthenope (Selys, 1839)

Notes on Local Behaviour.

This species was first recorded locally by Valletta in 1949, and the same author in 1951 recorded this species migrating to the Maltese islands. A large migration of this species was recorded by the present author in 2004, where a fairly large number of five hundred individuals were observed at Dingli cliffs. During the 19th-25th period, in concomitance with the largest migration of *Anax ephippiger* observed locally during the last decade, small numbers of *Anax parthenope* were also observed locally. According to the observations of the author conducted in the last four years, this species can be described as being the commonest aeshnid in Malta. This is because in most of the coastal areas where there is at least a vestige of standing water, this species is generally dominant. At least four local water bodies that were previously mostly dominated by *Anax imperator* are increasingly being frequented by *A. parthenope*. *Anax parthenope* is a hardier species than *A. imperator* as evidenced by the fact that it was also noted to patrol areas where water is brackish, ovipositing in them and in some cases, exuviae were collected. One classical place is l-Magħluq ta' Marsaxlokk (also known as il-Ballut). Sometimes, even deposition of ova in saltwater rock pools and in the sea directly was observed but no nymphs were ever collected from such instances. Degabriele (1992) states that exuviae belonging to this species were even recorded in brackish water. Recent observations might suggest that this species is on the increase locally and may be occupying areas previously dominated by *Anax imperator*.

Most other Odonata species tend to coexist more with *Anax imperator* than with this species. Only *Crothemis erythrea* and *Iscnura genei* were recorded in abundant numbers along with *A. parthenope*. The longest period of time elapsing between trapping and subsequent retrapping was for a male individual (fifty-six days), whilst a female individual was retrapped after forty-three days.

Feeding

This species was locally observed feeding extensively on several species of Dptera most of them associated with costal habitats Common Diptera prey species included *Exoprosopa jacchus* and *Cerdistus sp.*, whilst common Lepidoptera prey species included *Emmelina monodactyla*, *Pyrilidae sp* and *Pontia daplidice*. The latter was also

observed feeding on *Cercopidae sp.* *Anax parthenope* was also observed feeding on *Cicada orni* (Borg Cardona, personal communication).

Predation

Locally this species was observed being predated by many species similar to that of *Anax imperator*. At il-Maghluq ta' Marsaxlokk occasionally this species was attacked by *Passer hispaniolensis*, and at is-Simar while ovipositing it eggs, specimens were being devoured by *Aphanius fasciatus*. The same was noted at Ghajnsielem permanent fresh water body but the predator was a *Gambusia sp.*

Copulation

Nearly in all cases, the pair is in tandem and both have a strong grip while female is ovipositing. Only on two cases the pair was observed in tandem and only the male is holding firmly while the female is depending solely on the grip of the male primary genitalia while ovipositing.

Crocothemis (Brauer, 1868)

Crocothemis erythraea (Brulle', 1832)

Of the three aeshnid species recorded locally by McLachlan in 1899, this species is by far the commonest one in the Maltese Islands, being present in almost every local water body, easily coexisting with other Odonata species. While males tend to have a specific range of colours and tend to get darker with pruinosity with age, females are extremely variable in their colouration. Local specimens vary from light yellow colours to grey, brown and in two occasions even black specimens occurred. Sometimes they resemble the male's adult colour but never are they as dark red in colour and broad from the abdomen as the male. An interesting note is that the colour of the species is generally similar to the surrounding habitat where they are found, and since most of the local vegetation during the flight period is dry, yellow and brown are the commonest colours observed. This species was also observed ovipositing in brackish water. Moreover, the exuviae of this species were seen clinging to reeds by Degabriele in 1992. The latter behaviour was observed only once by the author at Is-Salina. The longest period of time elapsing between trapping and subsequent retrapping was for a female individual (fifty-four days), whilst a male individual was retrapped after forty-four days. Specimens were never found afar from the location where they were originally trapped and marked.

Feeding

Three species of Diptera were identified as prey of this species: *Musca domestica*, *Sarcophaga fertoni* and at San Anton gardens a female specimen of *C. erythraea* was observed capturing two individuals of *Ornithomyia avicularia* from a *Columbia livia domestica* that had approached a pond. *Cacyreus marshalli*, *Coenonympha pamphilus*, *Pyrallis farinalis* and *Pieris rapae* are the Lepidoptera that this species regularly feeds upon.

Predation

Locally this species was observed being predated by the avifauna *Merops apiaster*, *Apus apus*, *Passer hispaniolensis*, and *Sylvia melanocephala*. *Chalcides ocellatus* was observed feeding on a specimen however it is not known if the latter was already dead when located by the reptile. At Sarraflu pool, large females *Pelophylax bedriagae* were recorded preying occasionally on this species. *Carassius auratus*, *Gambusia sp* and *Dytiscus circumflexus* were observed feeding on nymphs of this species at San Anton gardens.

Orthetrum (Newmann, 1833)

Orthetrum brunneum(Fonscolombe,1837)

Since originally being first recorded locally by Valletta in 1949, only a handful of subsequent records are available of this species. On the 20th of July 2008, this species was sighted once by the author at a pond close to the Roman Villa at Rabat. Due to its rarity, no present information on its ecology has been gathered, although in the past, it may have been much commoner – in fact, the same species is mentioned more frequently in Degabriele's thesis of 1992. Also no confirmed record of this species breeding locally exists.

Orthetrum cancellatum(Linnaeus, 1758)

Notes on Local Behaviour

This species was first recorded locally by Valletta in 1949, and although in most previous published works, it was recorded as common, the distribution and abundance of this species has either declined or it was originally misidentified with other commoner species. During the current study, this species was recorded in two localities, where lately the abundance of the species has also regressed. The species population on the island of Malta presently extends from Ghadira nature reserve to the valley present at Cirkewwa, with an average of five records per annum. Only one record of the species was made in 2006, that of a female at is-Simar attempting oviposition with no success. In Gozo, until 2006, the species population extended from Ta' Sarraflu pool up to il-Qattara. For the past two years, specimens from Gozo were only sighted and recovered from the latter pool. Only ovipositing by females and the presence of exuviae was recorded from this site. This might be due to the presence of *Orthetrum trinacria* at the other sites, with the latter species being a constant threat to *O. brunneum*. Out of fifty specimens recorded as sightings, fifteen were trapped and marked and of the fifty individuals, only seven were males. The longest period of time elapsing between trapping and subsequent retrapping was for a female individual (forty-seven days), whilst no male individuals were ever re-trapped. Specimens were never found afar from the location where they were originally marked. Most of the specimens tended to keep away from sources of extraneous movement and unlike most species of Odonata, did not regularly use the same perch.

Feeding

This species was locally observed feeding extensively on several species of diptera, most of them associated with coastal habitat, however none were ever identified.

Predation

This species was observed being predated by *Orthetrum trinacria* at Sarraflu pond on two occasions. One specimen was observed being caught by *Chameleo chameleo* and during oviposition *Carassius auratus* and *Gambusia* sp were observed swimming around the specimen, presumably feeding on the ova of this Odonata species. At Ghadira nature reserve, one *Fulica atra* was sighted carrying a dead specimen in its beak.

Orthetrum coerulescens anseps (Fabricius, 1798)

Formerly recorded as *Orthetrum ramburi*, this species was first recorded locally by Valletta in 1957. Past literature gives the impression that this species is rare locally, but as from the year 2000, the author has noticed a range expansion of this species and also significant increases in its local abundance. There are several habitats where this species was spotted but the increase was observed mostly at the mouth of temporary freshwater streams, where these discharge into the sea. Two such areas are Ghajn Zejtuna valley and a watercourse close to Selmun. An increase in the abundance of this species was also noted on Comino. Females are highly variable and some specimens resemble immature males. Local studies were conducted by the author and Degabriele to confirm which subspecies is present locally and although two anomalous specimens' secondary genitalia were recorded, subsequent studies showed that to date *Orthetrum coerulescens anseps* is the only subspecies present in the Maltese Islands. The longest period of time elapsing between trapping and subsequent retrapping was for a female individual (thirty-nine days), whilst a male individual was retrapped after twenty days. Specimen females were never found afar from the location where they were originally marked, but males were found at distances as large as 5km from the original point of collection.

Feeding

This species was locally observed feeding extensively on several species of Diptera and micro-species of Coleoptera most of them associated with coastal habitats; however none of these have been identified to date.

Predation

Chameleo chameleon was observed preying on three individuals of *O. coerulescens anseps* and, during oviposition, *Carassius auratus* and *Gambusia* sp. at il-Qattara, Gozo were observed swimming around the specimen, presumably preying on the ova of the same Odonata species. One shrivelled-up specimen of *O. coerulescens anseps* was recorded at Buskett in an *Argiope lobata* web.

***Orthetrum trinacria* (Selys, 1841)**

Notes on Local Behaviour

This species was first recorded locally in 2003 (Ebejer *et al.* 2008) through one individual from Wied Znuber, and a few days later, a whole population was found at Ta' Sarraflu pool. Since then, over a two-year period, other records of the species in Gozo have not been made, but the vast majority of individuals were always recorded at Ta' Sarraflu.

Balzan (2008) also reports records of this species from il-Qattara, Grazzja Valley and Wied il-Lunzjata. In Malta, the species was recorded from several other sites but only as single individuals and rarely in pairs. The first confirmed breeding record for this species in Malta was at Majjistral Park in 2007. A few specimens of this species were also noted on Comino. An increase in the distribution of the species was accompanied by a regression of the formerly common species, including *Sympetrum fonscolombii* and *Crocothemis erythraea*. *S. fonscolombii* was noted to disappear in the presence of *O. trinacria*, as did the occasional species *Sympetrum striolatum*, which in most cases is misidentified as *Sympetrum fonscolombii*. The author observed sixteen cases in which this species hunted and fed upon *Sympetrum fonscolombii*, whilst in three cases, the species impinged in some way or another on *Sympetrum striolatum* and, in two other cases, it impinged upon *Orthetrum cancellatum*. *Crocothemis erythraea* seem to be the only species to coexist with this species. Occasionally, *O. trinacria* chases *Anax imperator* and *Anax parthenope* individuals in view of its highly territorial nature. Only rarely was *Trithemis annulata* observed in ponds where *O. trinacria* was dominant. Out of seventy-three individuals trapped and marked, only nine were females. The longest period of time elapsing between trapping and subsequent retrapping was for a male individual (eighty-one days), whilst a female individual was retrapped after sixteen days. Specimens were recorded at large distances (up to eight km afield) from where they were originally marked.

Feeding

This species was locally observed feeding extensively on relatively large prey (compared to its size), and exhibited aggressive behaviour. Besides the Odonata species listed above, this species was also observed feeding on *Bibio siculus*, *Calliphora vicina*, *Culex pipiens*, *Lucilia sericata* and *Sacrophaga fertoni*. *Colias crocea*, *Macroglossum stellatarum*, *Pararge aegeria*, *Pieris rapae*, *Pieris brassicae* and *Vanessa cardui* were some of the identified Lepidoptera species preyed upon, whilst similarly, *Evania appendigaster*, *Chrysis ignita*, *Polistes omissus*, *Polistes gallicus*, *Paravespula germanica* and *Apis mellifera* were the Hymenoptera species regularly preyed upon. A nymph of *O. trinacria* was observed eating a specimen of *Gambusia* sp.

Predation

Locally, this Odonata species was observed being predated upon only by *Pelophylax bedriagae* – however, a *Trachemys scripta elegans* individual was observed feeding on a dead specimen of this Odonata species.

Copulation

During copulations, other males often fly by and constantly attempt to disrupt the mating pair. Immature males have exactly the same colours as females and are frequently chased by males with a higher degree of prunosity.

Selysiothemis (Ris, 1897)

Selysiothemis nigra (Vander linden, 1825)

Notes on Local Behaviour

This species was first recorded locally by Valletta in 1957, through two specimens collected in 1952, and was not collected again till 1996, with just three individuals of this species being recorded to date. In 2007, one specimen was collected in July from Ramla Bay in Gozo, and in August a total of five female specimens were observed in a burnt field in an area known as tas-Sellun in Xaghra, Gozo. Shortly afterwards a permanent population was noted at two large artificial reservoirs in a valley at Marfa, Malta. In 2008, the author and some bird watchers at L-Ahrax and Ghadira nature reserves spotted a number of specimens. From 19th July to 22 August 2008, this species was observed on a daily basis, with records ranging from a single individual up to fifteen in a single day. This species must have been overlooked in these islands, however, as it is very inconspicuous and when in flight it so camouflaged (especially females). Out of thirteen individuals trapped and marked, only two were males. The longest period of time elapsing between trapping and subsequent retrapping was for a female individual (thirteen days), whilst males were never retrapped. Specimens were always found short distances from where they were marked.

Feeding.

This species was locally observed feeding extensively on beeﬂies (Diptera: Bombyliidae). Out of those identified were *Bombylius medius*, *Exoprosopa jacchus* and *Heteralonia megerlei*.

Copulation.

Two mating pairs were observed in August 2007. This was the only occasion, besides the instance at L-Ahrax, in which males were spotted and marked. Nymphs and exuviae were collected from Cirkewwa and this is the first record of local breeding of this species.

Sympetrum (Newmann, 1833)

Sympetrum fonscolombii (Selys, 1840)

Notes on Local Behaviour.

This species was first recorded locally by Valletta in 1949, and although in most previous works, it was recorded as very common, nowadays population numbers have decreased drastically, especially in the last three years. This may be attributed to the population increase of *Orthetrum trinacria*, which is normally accompanied by a decline in populations of *S. fonscolombii*. Most of the sites where *S. fonscolombii* is still quite common are coastal ones, which cannot support *Orthetrum trinacria* populations. *S. fonscolombii* individuals tend to hunt their prey away from water and in dry fields. In 2003, at Wied is- Sewda (Malta), the author observed several hundred individuals of this species emerge at the same time. One medium-sized field was replete with this species and exuviae were even packed as much as five on each other. A similar record (but involving smaller individual numbers) was observed by Valletta in 1949 and Degabriele in 1992. Also, on that day, a large number of *Passer hispaniolensis*, *Apus apus* and

Hirundo rustica were observed preying on the freshly emerged adults of this species. Out of two hundred and nine trapped and marked individuals, only forty-seven were re-trapped. The longest period of time elapsing between trapping and subsequent retrapping was for a male individual (sixteen days), whilst a female individual was retrapped after eleven days. Specimens were found at large distances away from their original marking site – for instance, one individual was marked at Dwejra (Gozo) and was retrapped at Mistra (Malta)

Feeding.

This species was locally observed feeding extensively on several species of Diptera, most of them associated with coastal habitats; of these, only *Musca domestica*, *Mintho compressa* and *Episyrphus balteatus* were identified.

Predation.

Besides the species mentioned above, *Chameleo chameleo* was observed several times at Ghadira nature reserve feeding on this species of Odonata. When the same Odonata species was more abundant at Sarraflu pool, *Pelophylax bedriagae* was recorded preying occasionally on it. *Podarcis filfolensis filfolensis* on Filfla was also observed preying on *S. fonscolombii*. At the opening to and inside a resting place of *Myotis punicus* and other Chiroptera species, several wings of *S. fonscolombii* were found, along with the droppings of these mammals. On three occasions, Chiroptera species were observed hunting the latter species at Ghadira Nature Reserve.

Copulation.

Mating pairs were generally found far from fresh water bodies. Both Degabriele (1992) and the author observed larvae of this species in brackish water. Many local naturalists including the author have observed such a species ovipositing in open sea.

***Sympetrum striolatum* (Charpentier, 1840)**

One of the first three recorded species locally by McLachlan in 1899, the latter species in recent years has decreased drastically, and this has been observed since the 1990's. The author has observed this species on a handful of occasions, but on one particular occasion, thirty-four specimens were trapped and marked at Cirkewwa, on the 12th of August 2007. None were ever retrapped. *S. striolatum* could easily be overlooked since, unless observed at very close proximity or actually being collected, individuals can easily be misidentified as old *Sympetrum fonscolombii*, as the latter species normally gets darker and the coloured veins and pterostigma dampen.

***Trithemis* (Brauer, 1868)**

***Trithemis annulata* (Palisot de Beavois, 1807)**

Notes on Local Behaviour.

The author first recorded this species locally in 2007 (Ebejer *et al.* 2008) but sightings dates back to 2005. In less than a year this species has flourished throughout the Maltese Islands, and sightings became more regular after the large *Anax ephippiger* migration that occurred in the dates 19/iv/2007-25/iv/2007. Before this, the latter species was confined to Chadwick lakes and the Chinese garden at Sta Lucija, where the first exuviae were collected. Nowadays exuviae were also collected from il-Qattara Gozo. Balzan (2008) also reports records of this species from il-Qattara,

Grazzja Valley, Wied il-Lunzjata and in one case at Ta'Sarraflu. Currently, it is the second most common species locally and is usually co-occurs with *Crocothemis erythraea*. While males patrol the area close to water bodies, females tend to stay afar; perching usually occurs quite more inland and only come close for ovipositing. Young males tend to have the thorax striped in black and the purple is only on top of the thorax. After fifteen days of emergence, the pruinosity of purple in males tends to get darker. Out of four hundred and five individuals trapped

and marked, only sixty-three were retrapped. The longest period of time elapsing between trapping and subsequent retrapping was for a female individual (twenty-four days), whilst a male individual was retrapped after twenty-two days. Specimens were always found at short distances from where they were originally marked.

Feeding

This species was locally observed feeding extensively on several species of Diptera. those identified were *Sphaerophoria scripta*, *Calliphora vomitoria*, *Calliphora vicina*, *Pollenia rudis*, *Phtyo adolescens*, *Stevenia deceptoria*, *Stomoxys calcitrans*, *Graphomya maculata*, *Suillia variegata*, *Limnophora obsignata*, *Mintho compressa*, *Melanophora roralis*, *Gymnosoma rotundata* and, *Prosopomyia pallida*. *Cacyreus marshalli* and *Coenonympha pamhilus* are the only two Lepidoptera known being predated by this species.

Predation

Locally, this species was observed being predated by the following avifauna. *Passer hispaniolensis* and *Sylvia melanocephala*. *Discoglossus pictus* was also observed preying on the latter. Exotic species such as *Pelophylax bedriagae*, *Trachemys scripta elegans*, *Carassius auratus* and *Gambusia sp* are known to take ova and nymphs of this species. On two occasions *Mantissa religiosa* was observed feeding on females of this species.

Copulation

Although few mating pairs were observed in several localities to date exuviae were only found in the two sites mentioned above. It is assumed that this species is not able to cope with conditions of drying water pools to complete its cycle, but requires a permanent fresh water pool.

***Trithemis arteriosa* (Burmeister, 1839)**

Only 1 female specimen of this species recorded locally by the author in 2002 is known, to date, (Ebejer *et al.* 2008). This record has become dubious as re-examination of this specimen by the author and by Degabriele has revealed the identity of this species to be closer to *Trithemis annulata* than to the assigned *T. arteriosa*. This specimen still requires further studies prior to its conclusive taxonomic identification.

CONCLUSIONS

Most of the behaviour recorded in the present study may be habitat-specific or due to certain restrictions found locally. Using *Anax imperator* as an example, this species may reach body sizes less than those of *Anax parthenope*, and this can be due to the lack of food in the water body, or because the same water is being pumped artificially for agricultural use, hence not allowing enough time for the nymphs to develop properly. On the other hand, artificial reservoirs have increased drastically in recent years, presenting an opportunity for most Odonata species, although a percentage of these artificial water bodies are not available to Odonata species, either because they are covered or since they harbour species introduced to control the proliferation of other aquatic life. In the case of *Anax imperator* mating with *Anax parthenope*, this might be due to the recent increase in numbers of the latter species or due to interspecific competition for the same space. Along with natural predators, alien species, such as *Pelophylax bedriagae*, *Trachemys scripta elegans*, *Carassius auratus* and *Gambusia sp* certainly do not aid any Odonata species in its early stages.

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Arnold SCIBERRAS¹, Jeffrey SCIBERRAS² & Alan DEIDUN³

ABSTRACT

The complete contents, amounting to 380 papers and short communications, of three local natural history periodicals are hereby listed and categorised to facilitate future retrieval by other co-workers.

Keywords: Natural history, periodicals

INTRODUCTION

The Central Mediterranean Naturalist (CMN), 'Potamon' and 'The Maltese Naturalist' are three local natural history periodicals, published during the following years:

The Maltese Naturalist = 1970-1976

Potamon = 1978-1989

CMN = 1979 –

on an annual basis, by a Maltese NGO (Non-Governmental Organisation). The NGO in question was called 'The Natural History Society of Malta' (NHSM), founded in 1962, renamed the 'Society for the Study and Conservation of Nature' (SSCN) in 1979 and later, in 1999, to Nature Trust (Malta). The CMN, which superceded 'The Maltese Naturalist' after an interval of three years, was edited by Edwin Lanfranco from 1979 to 1990, by David Dandria from 1990 (Volume 2, Issue 1) and by Alan Deidun as from 2007, whilst the journal Potamon was edited by Stephen. P. Schembri from 1979 to 1986 and by Charles. I. Sammut from 1988 to 1989. The Maltese Naturalist was edited by Guido Lanfranco. For a considerable number of years, the periodicals under review constituted the only local natural history publication. The complete contents of The Mediterranean Naturalist, published between 1891 and 1893, are listed by Schembri (1999), whilst other reviews of local natural history works include the ones by Lanfranco, G., compiled as a series of ten supplements within "News And Views" and 'The Maltese Naturalist' (1963-1976).

Potamon and The Maltese Naturalist also included current environment-related news and notices to members of the NGO, compiled within "News And Views", issued between 1963 and 1973. Since only papers and notes with scientific relevance are included in this work, such a compilation is overlooked for the purposes of this current work.

¹ – 131 'Arnest', Arcade Str, Paola – bioislets@gmail.com

² – 1 Marmir Bountempo Estate, Balzan- wildalienplanet@gmail.com

³ – Department of Biology, Junior College, University of Malta, Msida MSD 1252 – alan.deidun@um.edu.mt
(corresponding author)

This paper aims to list into 10 broad categories (further divided into a total of 45 sub-categories) all the contents of past issues of these journals with the purpose of facilitating their reference and retrieval by future co-workers. Taxa were chosen as categories and taxa are listed according to accepted taxonomic standing. Papers included in this compendium are listed within each category alphabetically, by first author name. Papers authored by the same workers are listed chronologically. The following protocol in listing down references was adopted:

AUTHOR (Year of publication). Title. *Journal*. **Volume** (Part): pagination

A total of 378 papers were published in the all the three journals under review (including papers included in the current issue of The Central Mediterranean Naturalist), which can be broken down further, as illustrated in Table 1.

Table 1 – Breakdown by journal title and category of the complete list of papers published in the three journals reviewed. (P.G. = Palaeontology & Geology; B.N. = Biological Nomenclature; N.H.R. = Natural History Reviews; H.R.A. = Historical Records and Appreciations).

Journal title	The Central Mediterranean Naturalist				The Maltese Naturalist			Potamon		
Number of published papers	141				79			158		
Category	Fungi	Algae	Lichens	Flora	Fauna	P.G.	Biotic communities	B.N.	N.H.R.	H.R.A.
Number of published papers	7	5	3	78	243	14	18	3	5	2

Fungi

BRIFFA, M. & LANFRANCO, E. (1986) The macrofungi of the Maltese Islands: Additions and notes. *The Central Mediterranean Naturalist* 4(1):69-79.

BRIFFA M. (2002) Some additions to the macrofungi of Malta. *The Central Mediterranean Naturalist* 3(4):197-202.

BRIFFA, M. (2001) Polypores recorded in Malta: additons and updated checklist. *The Central Mediterranean Naturalist* 3(3):125-130.

LANFRANCO, E. (1972) Mushrooms in Malta – new records. *The Maltese Naturalist* 1 (3):25-28.

LANFRANCO, E. (1979) *Colus hirudinosus*. *Potamon* 1(2):13.

TABONE, M. (2002) A survey of fungal diseases associated with *Vitis vinifera* L. In the Maltese Islands. *The Central Mediterranean Naturalist* 3(4):211-214.

ZAMMIT, M. Mushrooms. *Potamon* 1(9):110-111.

Algae

LANFRANCO, E. (1971) Maltese Dictyotaceous algae. *The Maltese Naturalist* 1(2):24-28.

LANFRANCO, E. (1974) Microscopic algae around Malta. *The Maltese Naturalist* 1 (5):3-14.

LANFRANCO, G. (1974) *Hydorchlathrus clathratus* (Bory) Howe. *The Maltese Naturalist* 1(5):22-23.

LANFRANCO, E., RIZZO, M., HALL-SPENCER, J., BORG, J.A. & SCHEMBRI, P.J. (1999) Maerl-forming coralline algae and associated phytobenthos from the Maltese islands. *The Central Mediterranean Naturalist* 3(1):1-6.

LANFRANCO, E. (2002) A contribution to the freshwater macroalgal flora of the Maltese Islands. *The Central Mediterranean Naturalist* 3(4):203-206.

Lichens

FIORENTINO, J. (2002) An appraisal of scientific names used in 1915 list of lichens of the Maltese Islands by Stefano Sommier and Alfredo Caruana Gatto. *The Central Mediterranean Naturalist* 3(4):189-196.

FIORENTINO, J. (2007) First record of *Pyrenula chlorospila* Arnold (Pyrenulales: Pyrenulaceae) from the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 191-195.

FIORENTINO, J. (2008) First record of *Pyrenocollema halodytes* (Nyl.) R. Harris (Pyrenulales: Pyrenulaceae) from the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4 (4): 213-219.

Flora (new records)

BRIFFA, M. (1986) Two interesting additions to the flora of the Maltese Islands. *The Central Mediterranean Naturalist* 1(4):85-86.

LALOV, S.V. & LANFRANCO, E. (2007) New records for the Maltese flora: *Opuntia microdasys* Lehm. (Pfeiffer) (Family. Cactaceae). *The Central Mediterranean Naturalist* 4(3): 199-200.

LANFRANCO, E. (1971) Some new flowering plants from Malta. *The Maltese Naturalist* 1 (2):3-7.

LANFRANCO, E. (1972) Additions and corrections to the Maltese flora. *The Maltese Naturalist* 1 (3):14-20.

LANFRANCO, E. (1973) Additions and corrections to the Maltese flora. *The Maltese Naturalist* 1 (4):8-10.

LANFRANCO, E. (1974) New flowering plants from Malta. *The Maltese Naturalist* 1(5):21.

LANFRANCO, E. (1975) Some Additions to the Maltese Flora. *The Maltese Naturalist* 2(2):47-48.

LANFRANCO, E. (1979) Additions to the Maltese Flora. *The Central Mediterranean Naturalist* 1(1):13-17.

LANFRANCO, E. (1983) Two new casual grasses from Malta. *The Central Mediterranean Naturalist* 1(2):47-48.

LANFRANCO, E. (1989) The Maltese Cliff-Orache – *Cremnophyton lanfrancoi* – A New Genus and Species from the Maltese Islands. *Potamon* 2(17):185-188.

LANFRANCO, E. (2000) New Records of Maltese flora: *Eleusine indica* (L.) Gaertner subs. *africana* (Kennedy O'byrne) S.Phillips (Poaceae) and *Centranthus macrosiphon* Bossier (Caprifoliaceae). *The Central Mediterranean Naturalist* 3(2):55-56.

LANFRANCO, E. & BUTTIGIEG, R. (2001) New records for the Maltese flora: *Centaurea acaulis* L. (Astericeae). *The Central Mediterranean Naturalist* 3(3):147-148.

LANFRANCO, E. & SPITERI, H.J. (2001) New records for the Maltese flora: *Panratiun foetidum* Pomel (Amaryllidaceae). *The Central Mediterranean Naturalist* 3(3):147.

MIFSUD, S. (2008). Three new species from the Genus *Ophrys*, section *Pseudophrys* [ORCHIDACEAE], on the Maltese Islands. *The Central Mediterranean Naturalist* 4(4): 243-252.

SILVERWOOD, J.H. (1971) Maltese Flora: Recent additions & notes. *The Maltese Naturalist* 1 (2):8-9.

TABONE, J.T. (1995) *Othantus maritimus* (L.) Hofmannsegg et Link (Family. Asteraceae) and *Crypsis schoenoides* (L.) Lamarck (Family. Poaceae), two new additions to the flora of the Maltese islands. *The Central Mediterranean Naturalist* 2(3):97-100

TABONE, J.T. (2008) *Elytrigia repens* (L.) Desvaux ex Nevski (Fam. Poaceae), a new record for the Maltese Islands. *The Central Mediterranean Naturalist* 4(4): 343-344..

Flora (extensive reviews of plant groups)

LANFRANCO, E. (1976) Report of the Present Situation of the Maltese Flora. *The Maltese Naturalist* 2 (3):69-80.

LANFRANCO, E. (1979) Looking at Plants, 1: Dispersal in *Posidonia*. *Potamon* 1(1):8.

LANFRANCO, E. (1979) Looking at Plants, 2: The Land Caltrops. *Potamon* 1(2): 18.

LANFRANCO, E. (1979) Looking at Plants, 3: *Acetabularia*. *Potamon* 1(3):29.

LANFRANCO, E. (1980) Looking at Plants, 4: the Squirting Cucumber. *Potamon* 1(4):43

LANFRANCO, E. (1980) Looking at Plants, 6: Lichens. *Potamon* 1(5):57-58.

LANFRANCO E. (1981) Looking at Plants, 6: Stinging Nettles. *Potamon* 1(6):69-70.

LANFRANCO, E. (1981) Looking at Plants, 7: The Sea-Firs. *Potamon* 1(7):82-83.

LANFRANCO, E. (1981) Looking at Plants, 9: The *Narcissus*. *Potamon* 1(8):101.

LANFRANCO, E. (1982) Looking at Plants, 9a: The Seaweeds. *Potamon* 1(9):122-124.

LANFRANCO, E. (1981) Plants of the Gozo Citadel. *Potamon* 1(8):102.

LANFRANCO, E. (1982) To the Rescue. *Potamon* 1(9):124.

LANFRANCO, E. (1982) Looking at Plants, 10: The Mosses. *Potamon* 1(10):143-145.

LANFRANCO, E. (1983) The Flora of St. Paul's Islands. *Potamon* 2(11):23-31.

LANFRANCO, E. (1984) Looking at Plants, 11: Galls. *Potamon* 2(12):60-61.

LANFRANCO, E. (1984) The Endemic Flowering Plants of Malta. *Potamon* 2(13):71-73.

- LANFRANCO, E. (1984) List of Flowering Plants Endemic to the Maltese Islands. *Potamon* 2(13):78.
- MIFSUD, S. (2007) Updates in the flora of the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3):169-177.
- MIFSUD, S. (2008) Update of the Maltese Flora (Central Mediterranean), including three new taxons of vascular plants. *The Central Mediterranean Naturalist* 4(4): 263-273.
- SILVERWOOD, J.H. (1972) Observations on grasses and other plants met with during 1972. *The Maltese Naturalist* 1 (3):21-23.
- SILVERWOOD, J.H. (1973) The genus *Anaranthus* in Malta. *The Maltese Naturalist* 1 (4):3-6.
- SILVERWOOD J. H. (1975) The genus *Ficus* in Malta. *The Maltese Naturalist* 2(1):5-6.
- TABONE, T.J.(2007) A list of records of some rare vascular plants occurring in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 178-186.
- TABONE, J.T. (2008). A list of records of some rare vascular plant species occurring in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(4): 311-337.

Flora (additional information on previously recorded individual species)

- BRIFFA, M. (1981) The Elm Tree in Malta. *Potamon* 1(8):95-96.
- BRIFFA, M. (1984) Notes on the Flora of Malta- 3: *Crepis bursifolia* Linnaeus. *The Central Mediterranean Naturalist* 1(3):56.
- BRIFFA, M. (1993) The occurrence of *Echium sabulico* Pomel (= *E.confusum* De Coincy) in the Maltese islands. *The Central Mediterranean Naturalist* 2(2):26-27.
- BRULLO, S.& LANFRANCO, E.(1983) Notes on the Flora of Malta: *Juncus subulatus* Forsk. *The Central Mediterranean Naturalist* 1(2):46.
- LANFRANCO, E. (1970) Occurrence of *Halophila stipulacea* in Maltese waters. *The Maltese Naturalist* 1 (1):16-17.
- LANFRANCO, E. (1974) Notes on the distribution of *Melitella pusilla*. *The Maltese Naturalist* 1(6):19-23.
- LANFRANCO, E. (1974) Flowering and fruiting of *Posidonia aceanica*. *The Maltese Naturalist* 1(5):22.
- LANFRANCO G. (1975) *Convolvulus oleaefolius*. *The Maltese Naturalist* 2(2):39-40
- LANFRANCO, E. & BRIFFA M. (1984) Notes on the Flora of Malta-2: *Ammannia coccinea*. Rottboel. *The Central Mediterranean Naturalist* 1(3): 55.
- LANFRANCO, S. & LANFRANCO, E. (1999) *Riella helicophylla* (Mont.) Hook, a new addition to the macrophytic wetland flora of the Maltese Islands (Bryophyta, Marchantiopsida, Riellaceae). *The Central Mediterranean Naturalist* 3(1):13-14.

MIFSUD, S. (2008). New populations of the yellow and violet forms of *Iris pseudopumila* Tineo IRIDACEAE and marked differences between the two forms. *The Central Mediterranean Naturalist* 4(4): 253-262.

SILVERWOOD, J.H. (1974) *Asclepias curassavica*(L) *The Maltese Naturalist* 1 (5):21.

STEVENS, D.T. (2001) On the occurrence of *Capsella rubella* Reuter (Brassicaceae) in the Maltese Islands. *The Central Mediterranean Naturalist* 3(3): 117-118.

ZAMMIT MAEMPEL, G. (1999) Malta's national plant, *Palaeocyanus crassifolius* (Bertoloni) Dostal (Asteraceae) and some arthropod visitors. *The Central Mediterranean Naturalist* 3(1):35-42.

Flora (rediscovery of previously-thought extirpated species)

LALOV, S.V. (2007) Rediscovery of *Asparagus stipularis* Forskal (Family. Asparagaceae) in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 196-198.

LALOV, S.V., CASHA, A., LANFRANCO, E., PSAILA, M., & TABONE, T.J. (2007) Rediscovery of *Ornithogalum divergens* Boreau (Hyacinthaceae) in Malta (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 201-203.

LALOV, S.V., SEGINKOVA, A. & SULTANA, J. (2008). Rediscovery of *Asplenium sagittatum* and *A. marinum* (Pteridophyta: Aspleniaceae) in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(4): 235-241.

LALOV, S.V. & LANFRANCO, E. (2008). Rediscovery of *Erophila verna* (L.) Chevallier (Brassicaceae), *Pteridium aquilinum* (L.) Kuhn (Dennstaediaceae) and *Crataegus azarolus* L. (Rosaceae) on the island of Malta (Central Mediterranean). *The Central Mediterranean Naturalist* 4(4): 225-233.

LANFRANCO, E. & STEVENS, D. (2000) Rediscovery of *Lotus halophilus* Bossier et Spruner (Fabaceae) from the Island of Comino (Malta, Central Mediterranean). *The Central Mediterranean Naturalist* 3(2):59-60.

TABONE, T.J. (2007) The rediscovery of *Asplenium trichomanes* L. (Fam. Aspleniaceae) in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 208-209.

Flora (informal notes on previously recorded species taken during natural history excursions)

EXCURSIONIST (anon.) (1970) Excursions during January, February, March 1970. *The Maltese Naturalist* 1(1):3-7.

EXCURSIONIST (anon.) (1971) Some recent excursionism. *The Maltese Naturalist* 1 (2):17-23.

EXCURSIONIST (anon.) (1972) N.H.S.M. excursions during 1972. *The Maltese Naturalist* 1(3):6-9.

LANFRANCO, E. (1979) S.S.C.N. Excursion to Wied Babu -18th March 1979. *Potamon* 1(1):8-9.

LANFRANCO, E. (1979) S.S.C.N. Excursion to the Dahlet Fekruna Area - 21st April 1979. *Potamon* 1(1):9.

LANFRANCO, E. (1979) Excursion to Wied Hassabtan – 13th May 1979. *Potamon* 1(1):10.

LANFRANCO, E. (1979) S.S.C.N. Excursion to Ghadira – 16th June 1979. *Potamon* 1(2): 19.

LANFRANCO, E. (1980) S.S.C.N. Excursion to Wied l-Isqof – 29th September 1979. *Potamon* 1(4):42.

- LANFRANCO, E. (1980) S.S.C.N. Excursion to Wied il-Ghasel - 28th October 1979. *Potamon* 1(4):44.
- LANFRANCO, E. (1980) S.S.C.N. Excursion to Wied Hassabtan – 24th November 1979. *Potamon* 1(4):44.
- LANFRANCO, E. (1981) S.S.C.N. Excursion to the Bahrija Valley – 22nd November 1980. *Potamon* 1(6):63.
- LANFRANCO, E. S.S.C.N. (1981) Excursion to the Bingemma Area - 31st May 1981. *Potamon* 1(7):79.
- LANFRANCO, E. (1981) S.S.C.N. Excursion to the Dingli Cliffs – 8th March 1981. *Potamon* 1(7):81.
- S.S.C.N. (anon.) (1988) Excursion Handout – 1987. *Potamon* 2(16):158-165.
- WAYFARER (anon.) (1972) Rare plants met with during 1972. *The Maltese Naturalist* 1 (3):29-30.
- WAYFARER (anon.) (1973) Worm's eye view. *The Maltese Naturalist* 1 (4):19-25.
- WAYFARER (anon.) (1976) *Iris pseudopumila*. *The Maltese Naturalist* 2(3):61.

Fauna (Coelenterata)

- SCHEMBRI, M. (1985) The Hydras. *Potamon* 2(14):94.
- LANFRANCO, G. (1979) *Cotylorhiza tuberculata* (Marci) (Cnidaria, Scyphozoa) in large numbers. *The Central Mediterranean Naturalist* 1(1):23.
- LANFRANCO, E. (1981) The Jellyfish are coming! *Potamon* 1(7):83.

Fauna (Platyhelminthes)

- LANFRANCO, E. (1970) Terrestrial Flatworms in Malta. *The Maltese Naturalist* 1(1):12.
- LANFRANCO E. (1975) Short notes on *Bipalium kewense* and *Acetabularia moebii*. *The Maltese Naturalist* 2(2):49.
- LANFRANCO, E. (1975) *Bipalium kewense* Mosley (platyhelminthes) in Malta. *The Maltese Naturalist* 2(2):50.

Fauna (Tardigrada)

- BORG, M. J.(1986) Tardigrades . *Potamon* 2(15):113.

Fauna (Annelida)

- SCHEMBRI, P.J. (1986) A note on non-marine leeches (Annelida: Hirudinea) from the Maltese Islands. *The Central Mediterranean Naturalist* 1(4):81-83.
- SAVONA-VENTURA, C., SAWYER, R.T. & SCHEMBRI P.J. (2000) Medicinal and other leeches(Annelida, Hirudinea)in the Maltese Islands. *The Central Mediterranean Naturalist* 3(2):65-68.
- SCHEMBRI, P. J. & GAUCI, M.(1984) Unusual Earthworms from Il-Maqluba. *Potamon* 2(12):47.

Fauna (Mollusca)

- AGIUS, I. (1976) The Rock-Boring Date-Mussel. *The Maltese Naturalist* 2(3):65-68
- CACHIA, C. (1972) Shelled molluscs collected at Salina Bay during 1965 – 1971. *The Maltese Naturalist* 1 (3):10-11.
- CACHIA, C. (1972) *Pinna nobilis* L. *The Maltese Naturalist* 1 (3):24.
- CACHIA, C. (1973) Further notes on marine shelled Mollusca. *The Maltese Naturalist* 1 (4):30-32.
- CACHIA, C. (1975) The Genus *Spondylus* in the Maltese Waters. *The Maltese Naturalist* 2 (2):51-52.
- LANFRANCO, G. (1971) Cypraeidae of Malta (Cowries). *The Maltese Naturalist* 1(2):12-16.
- LANFRANCO, G. (1974) Maltese names of local land Mollusca. *The Maltese Naturalist* 1(5):24-26.
- LANFRANCO, G. (1974) Maltese names of local marine Mollusca. *The Maltese Naturalist* 1(5):27-39.
- LANFRANCO, G. (1977) The Cowries and allied shells of the Maltese Islands. *The Maltese Naturalist*. Supplement 1:4pgs
- LANFRANCO, G. (1980) Micromollusca from Marsaxlokk Bay – Malta. *Potamon* 1(5):55.
- MIFSUD, C. (1989) Shells from St. Thomas Bay. *Potamon* 2(17):182-185.
- MIFSUD, C., SAMMUT, P. M., & CACHIA, C. (2003) On some alien terrestrial and freshwater gastropods (Mollusca) from Malta. *The Central Mediterranean Naturalist* 4(1):35-40.
- MIFSUD, C. & SAMMUT, P.M. (2007) Notes on the land and freshwater Mollusca of the island of Gozo (Maltese Islands). *The Central Mediterranean Naturalist* 4(3):162-168.
- SCHEMBRI, P. J. (1981) The Maltese Top Shell, *Gibbula nivosa*. *Potamon* 1(7):76-77.
- SCHEMBRI, P. J. (1984) Notes on *Acanthochitona oblonga*. *Potamon* 2(13):89.
- SCHEMBRI, T. & SCHEMBRI, P.J. (1997) Records of Cephalopods from the Maltese surrounding waters (Central Mediterranean). *The Central Mediterranean Naturalist* 2(4):124-135.
- THAKE, M. (1970) Occurance of *Helix pomatia* in Malta. *The Maltese Naturalist* 1(1):8.
- THAKE, M. (1973) *Pomatias elegans*, Mullier in Malta. *The Maltese Naturalist* 1(4):7&32.
- THAKE, M. (1984) The Endemic molluscs of Malta. *Potamon* 2(12):36-39.
- THAKE, M.A. (1984) New records of land snails inhabiting leaf litter from the Maltese Islands.(Mollusca: Gastropoda: Pulmonata). *The Central Mediterranean Naturalist* 1(3):63-65.
- THAKE, M.A. (1984) Land snails from Comino.(Mollusca: Gastropoda). *The Central Mediterranean Naturalist* 1(3):66-68.

THAKE, M. A. (1985) Land Snails from the Mellieha Quaternary Deposit. *Potamon* 2(14):93.

Fauna (Arthropoda - Chilopoda and Diplopoda)

SCHEMBRI, P.J. & EBEJER, K.A. (2001) Polyxenid millipede (Diplopoda, Polyxenida) associated with empty snail shells. *The Central Mediterranean Naturalist* 3(3):97-100.

Fauna (Arthropoda – Symphyla)

SCHEMBRI, P. J. (1984) First Record of the Class *Symphyla* from the Maltese Islands. *Potamon* 2(13):90.

Fauna (Arthropoda – Arachnida)

BALDACCHINO A.E., DANDRIA D., LANFRANCO, E. & SCHEMBRI P.J. (1993) Records of spiders (Arachnida : Araneae) from the Maltese islands (Central Mediterranean) *The Central Mediterranean Naturalist* 2(2):37-59.

DANDRIA, D. (2001) Observations on the endemic Maltese trap door spider *Nemesia arboricola* Pocock, 1903 (Araneae: Nemesiidae). *The Central Mediterranean Naturalist* 3(3):103-108.

DANDRIA D. & MAHONEY P. (2002) First record of spider poisoning in the Maltese Islands. *The Central Mediterranean Naturalist* 3(4):173-176.

DANDRIA, D., FALZON, V. & HENWOOD, J. (2005) The current knowledge of the spider fauna of the Maltese Islands, with the addition of some new records (Arachnida: Araneae). *The Central Mediterranean Naturalist* 4(2):121-130.

SCHEMBRI, P. J. (1982) Harvestmen. *Potamon* 1(10):146-147.

SCHEMBRI, P.J. and SCHEMBRI, S. (1990) A note concerning the scorpions (Arachnida: Scorpions) of the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 2(1):15-21.

Fauna (Arthropoda – Insecta – General)

CILIA J. (1975) Insect Visitors to the Seaside Squill. *The Maltese Naturalist* 2(2):37-38.

CILIA, J. L. (1982) Nest Architecture in Maltese Insects (Part 1). *Potamon* 1(9):116-119.

CILIA, J. L. (1982) Nest Architecture in Maltese Insects (Part 2). *Potamon* 1(10):140-141.

FARRUGIA, C. (1997) Insect pests on cauliflower (*Brassica olearacea* var. *botrytis*) in Gozo (Maltese Islands, Central Mediterranean). *The Central Mediterranean Naturalist* 2(4):152-165.

HABER, G. & MIFSUD, D. (2007) Pests and diseases associated with olive trees in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist* 4(3): 142-161.

MIFSUD, D. & WATSON, G.W. (1999) Introduced sap feeding pests of crop plants in the Maltese islands. *The Central Mediterranean Naturalist* 3(1):29-34.

SCHEMBRI, J.L. & SCHMBRI, S.P. (1979) Some Cases of Teratology in Maltese Insects. *Potamon* 1(2):20.

SCHEMBRI, S. P. & CILIA, J. L. (1983) Insects of St. Paul's Islands. *Potamon* 2(11):12-14.

VALLETTA, A. (1979) Insect Pollinators on *cynara cardunculus* L. *The Central Mediterranean Naturalist* 1(1):22.

Fauna (Arthropoda – Insecta – Coleoptera)

BELLES, X. & MIFSUD, D. (2000) Ptinid Beetles (Cloeoptera, Ptinidae) from the Maltese Islands. *The Central Mediterranean Naturalist* 3(2):43-48.

BRIFFA, C. (1980) Walking Upside Down in Water. *Potamon* 1(5):58.

BONETT G. & SCHEMBRI S.P. (1976) *Anoxia matutinalis* Lap. in Malta (Coleoptera). *The Maltese Naturalist* 2(3):58-59.

CILIA, J. (1974) Revision of the Scolytinae (Coleoptera). *The Maltese Naturalist* 1(5):15-20.

CILIA, J. L. (1975) Abnormal specimens of *Chaenius circumscriptus* Dult. (Coleoptera: Carabidae). *The Maltese Naturalist* 2(1):25.

CILIA, J. L. (1975) Additional spots on the seven spot ladybird, (Coleoptera: Coccinellidae). *The Maltese Naturalist* 2(1):26.

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A LIST OF RECORDS OF SOME RARE VASCULAR PLANT SPECIES OCCURRING IN THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

Timothy J. TABONE¹

ABSTRACT

A check-list of one hundred and twenty-three (123) rare or infrequent vascular plant species occurring in the Maltese Islands is hereby given, along with brief notes concerning the record date and location, population size and distribution on the islands.

Keywords: rare, infrequent, vascular plant species, Maltese Islands

KEY

In compiling the following species list, the author has followed the family sequence adopted by Lanfranco 2001.

For each species, the localities where populations of the species were discovered by the author are given. The wider district where a specific locality is situated is given when:

a) the locality name is a micronym known only by a handful of farmers who happen to live or own land in the same locality, eg. Dingli cliffs area (district): Rdum ta' Hurrieqa (micronym);

b) when a single toponym serves different specific localities that are well separated geographically, eg. Il-Mosta area: (district) Wied Hanzir (a toponym for at least 3 different valleys in Malta and Gozo).

(**P.1**) = Other records for this species are listed in **Part 1** published in The Central Mediterranean Naturalist Volume 4 Part 3, 2007.

(**P?**) = Specimens found are doubtfully autochthonous and may have been planted.

* = Species no longer found in specific locality.

(**Number**) = Number of individuals found in a locality on date of discovery.

The list covers a period of research from Spring 1991 to Summer 2008. The date on which each species was first discovered is given in brackets. In cases where the exact date of discovery was not recorded, an approximate date is given:

(early 1990's) = found between 1991 and 1995;

(late 1990's) = found between 1996 and 1999;

¹ Address: P.O.BOX 605, VALLETTA VLT1000; Email: Timothy.Tabone@gmail.com

(c. xxxx) = found in the year xxxx or up to 2 years before or after that year.

In some cases (eg. *Medicago monspeliaca*), identification was made from dead dessicated specimens found during the summer drought, not during the active growth season. Identification was made possible by the presence of the distinctive fruits that were well preserved.

The third and final part of this Species List series will be published in the next issue of The Central Mediterranean Naturalist.

ERRATA CORRIGE for PART 1. (THE CENTRAL MEDITERRANEAN NATURALIST Volume 4 Part, 2007).

2. *Delphinium staphisagria* L.

GOZO - Mgarr valley * (7-1992) *should read as:* GOZO - l-Imgarr area: Taht ta' l-Erbgħa / ta' Setgħer * (7-1992).

31. *Trifolium angustifolium* L.

MALTA - high ground overlooking Wied Babu (vicinity of il-Hofra tal-Bħir) (24-6-2003) *should read as:* rocky terraces overlooking Wied Babu (below il-Hotba) (3-2000).

33. *Vicia villosa* Rothmaler

MALTA - Dingli cliffs area: among a boulder scree facing the North East side of il-Wardija ta' San Ġorġ (29-4-2003) *should read as:* Dingli cliffs area: among a boulder scree at the turning point between Rđum ta' Ħurrieqa and il-Wardija ta' San Ġorġ (29-4-2003).

58. *Ophrys lutea* Cavanilles *should read as:* *Ophrys lutea* Cavanilles s.l. incl. *Ophrys sicula* Tineo

MALTA - high ground overlooking Wied Babu (vicinity of il-Hofra tal-Bħir) (c.2000) *should read as:* MALTA - rocky terraces overlooking Wied Babu (below il-Hotba) (3-2000).

Species list:

PART 2

Phylum: *Lycophyta*

Class: *Lycopsida*

Family: *Selaginellaceae*

1. *Selaginella denticulata* (L.) Spring

MALTA - San Ġwann area: the turning point between Wied il-Kbir / tal-Frañċiż and Wied Ġhomor (1995) - Wied il-Faħam (5-4-2000) - Wied Ħanżir (parallel to Wied Qirda) (1992) (*abundant in some parts, forming extensive mats; possibly the largest population in the country*) - Wied Ħarq Ħamiem (1) (1995) - Wied Qirda (1992).

Phylum: *Sphenophyta*

Class: *Equisetopsida*

Family: *Equisetaceae*

2. *Equisetum ramosissimum* Desfontaines

MALTA - il-Baħrija area: many places including ta' Ghambierda, tat-Tulliera (1992) - Burmarrad (early 1990's) - Dingli cliffs area: Rdum Dikkiena (1995) - Ġnien il-Kbir, Ġnien iż-Żgħir, Wied ta' l-Isqof valley system (1992) - il-Girgenti (1992) - Ġhajn il-Kbira (1992), Wied tal-Girgenti (1991) valley system - Ġhajn Tuffieħa area: abundant around Roman baths, il-Ġnien, along Wied il-Ġinna, tas-Sold, up to ir-Ramla tal-Mixquqa / ir-Ramla ta' Snien / Golden bay (1992) - l-Imtahleb area: il-Bruka, Wied ta' Markozz, along path leading to ta' Pajpurijiet, along path leading to ta' Soklos, Wied ir-Rummien (1992) - l-Imtarfa area: Ġhajn Kellija (15-2-1995) - ir-Rabat area: on a *ħitan tas-sejjeħ* along a road connecting Ġhajn Qajjet and Ġnien Fieres (2001) - Wied tal-Ġnejna: il-Ġnien (1992) - Wied il-Hesri (19-6-2006) - Wied il-Luq (*only 1 small patch in a wooded area*) (2004).

GOZO - Wied ir-Riħan (early 1990's).

Phylum: *Filicophyta*

Class: *Filicopsida*

Family: *Hemionitaceae*

3. *Anogramma leptophylla* (L.) Link

MALTA - Il-Maqluba (1991) - Ras il-Pellegrin (7-4-2008) - San Ġwann area: turning point between Wied Ghomor and Wied il-Kbir (early 1990's) - Wied Babu (1991) - Wied il-Fulija (vicinity of Salib tal-Għolja) (12-2005) - Wied Ġhar Dalam (3-10-2003) - Wied il-Għasel, Wied l-Isperanza, Wied is-Sjir valley system (1992) - Wied Ħanżir (2000) - Wied tal-Kalkara (10-3-2004) - Wied Qirda (1992) - Wied Żnuber (1995).

GOZO - below Fort Chambray (west side) (4-3-2004) - Mgarr ix-Xini (12-1992) - il-Munxar area: Wied tal-Għawdxija (30-11-2007) - Ta' Ċenċ area: Fuq tal-Gruwa (18-10-2005) - ix-Xagħra area: Rdum ta' Kilulu, Rdum tas-Surgu, Ġhajn Barrani cliffs and boulder screes (21-3-2004) - iż-Żewwieqa (9-12-2007).

Family: *Aspleniaceae*

4. *Asplenium ceterach* L.

MALTA - Wied Ġhar Dalam (1) (3-10-2003) - Wied il-Għasel area: ta' Sunta l-Għawdxija (?) (on terraces at the last valley turn just before the quarry) (12-1992), below ta' Barbamaru (on South-facing valleyside, just before main road bridge) (11-3-2008) - Wied Żembaq (3-10-2003).

GOZO - iż-Żewwieqa (1) (9-12-2007).

The only previous record for Gozo was from Xlendi (Gulia, later cited by Borg).

5. *Asplenium trichomanes* L.

GOZO - Ta' Ċenċ area: Fuq tal-Gruwa (15) (18-10-2005) - iż-Żewwieqa (8) (23-2-2008).

Phylum: Magnoliopsida

Class: Magnoliopsida

Family: *Ranunculaceae*

6. *Clematis cirrhosa* L.

MALTA - il-Bahrija area: Wied il-Mielah (1992) - Il-Buskett area: woodland below ix-Xaghra tal-Bosk (12-2-2008) - Dingli cliffs area: Scree between Rdum tal-Madalena (below Madalena chapel) and il-Wardija; Wied tal-Kappillan (early 1990's) - il-Fawwara (1995) - Ġnien Ghajn Tuffieħa (1996) - Ġnien iż-Żghir (1992) - Hoffret ir-Rizz (18-3-2004) - l-Imselliet area: scree around ix-Xaghra tat-Tombu and Għar ir-Rajs (26-10-2006) - l-Imġarr area: Triq il-Kbira (leading to il-Bokka taċ-Ċerċura) (early 1990's) - l-Imtarfa area: Santa Luċija (16-1-2002) - Marfa peninsula: rocks below il-Minzel ta' Piswella (1-1993) - il-Mellieħa area: Ġnien Inġraw (2000); escarpments between Ġnien Inġraw and Wied tal-Madonna (2000); Ghajn Żejtuna (early 1990's); between Ras il-Griebeġ and Ghajn Żejtuna (14-3-2000); Wied il-Għajn (2000); Qasam Barrani (2002) - Mġarr area: an escarpment below ix-Xaghra ta' San Martin (vicinity of tal-Palma) (1998) - Misraħ Ġhonoq (4-2002) - Pembroke (early 1990's) - north side of il-Qolla (vicinity of Chadwick Lakes / Wied il-Qliegħa) (14-3-2003) - Ras il-Pellegrin (early 1990's) - scree between is-Salib tal-Għolja and Wied il-Fulija (early 1990's) - San Ġwann area: Wied Ġhomor (1995) - San Martin (7-1992) - rocks overlooking Triq il-Mistra (5-11-2006) - tal-Virtu (28-5-2008) - Wied Babu (1992) - Wied ta' Bingemma / il-Ġnien ta' Bingemma (3-11-2007) - Wied id-Dis (5-4-2000) - Wied tal-Ġnejna: il-Ġnien (1992) - Wied Ghollieqa (1991) - Wied il-Hesri (early 1990's) - Wied il-Hmar area (vicinity of Tas-Santi): il-Port (5-2-2004) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied Moqbol / Wied Brandina (9-10-2002) - Wied ta' Seqła (vicinity of l-Imselliet) (13-4-2002) - Wied Xkora (3-2000) - Wied Żnuber (1995) - iż-Żebbieġh: rubble walls alongside Triq iż-Żebbieġh, Triq l-Imġarr (13-4-2002).

GOZO - Mġarr ix-Xini (12-1992) - il-Munxar area: Wied tal-Għawdxija (14-11-2007) - Ta' Ċenċ area: Fuq tal-Gruwa (18-10-2005) - ix-Xaghra area: abundant among boulder scree and rubble walls at il-Pergla, Ghajn Barrani, Rdum tas-Surgu, Rdum ta' Kilulu (21-3-2004) (*possibly the most extensive population in the country, at places dominating continuous stretches of 20m square or more*) - Wied Ilma (below Ghajn Għabdun hill) (21-10-2006) - Wied is-Sabbara (26-1-2008) - iż-Żewwieqa (9-12-2007).

C.cirrhosa was recorded in the past as: " **Malta**, qua e la ... **Gozo**, piuttosto rara " (Sommier & Caruana Gatto 1915). Seems to have increased and become frequent, abundant in some areas, probably due to the elimination of grazing herds.

7. *Ranunculus arvensis* L.

MALTA - il-Girgenti (1992) - l-Imtarfa area: fields alongside it-Telgħa ta' Slampa (31-5-2008).

Partial to cultivated fields with clay soils.

8. *Ranunculus bulbosus* subsp. *aleae* (Willkomm) Rouy & Foucault

MALTA - il-Bahrija area: valleybed between il-Qliegħi and it-Tulliera (1992) - il-Bidnija area (21-12-2002) - il-Fiddien (1992), Wied il-Qlejgħa (c. 2001) valley system - Wied il-Fulija (vicinity of is-Salib tal-Għolja) (12-2005) - Wied Gerżuma (1992) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied il-Hesri (1992) - Wied il-Hmar (vicinity of tas-Santi) (7-3-2008) - Wied il-Luq, Wied tal-Girgenti valley system (1992) - Wied ta' Seqła (vicinity of l-Imselliet) (13-4-2002) - Wied Xkora (3-2000), Wied Hanżir, Wied Qirda, Wied il-Kbir, il-Marsa (1992) valley system.

9. *Ranunculus ficaria* L.

MALTA - Wied Għolliċa (1992) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied il-Luq (1992) - Wied Xkora, Wied Hanzir valley system (3-2000) - Wied Żembaq (3-10-2003).

10. *Ranunculus trichophyllus* Chaix

MALTA - il-Fiddien, Wied il-Qliegħa valley system (late 1990's) - Wied tal-Girgenti (1992)* - Wied tal-Hżejjen (13-4-2002).

Family: *Papaveraceae*

11. *Hypocoum imberbe* Smith

MALTA - Għajn Tuffieħa area: il-Wita tat-Torri (2008); it-Tafal (21-5-2008) - Marfa peninsula: Wied ta' Msid / tal-Merħla (2002); Wied ta' l-Armier (12-3-2008) (*possibly the largest population in the country*).

GOZO - tal-Bardan (5-3-2008) - il-Qala area: il-Gwiedi (19-4-2005) - San Lawrenz area: tal-Foqra (along road down to id-Dwejra) (1995); l-Almagħaġ (20-2-2008) - Santa Luċija area: ta' Klula (5-4-2004).

A rare agrospecies found in fields with shallow soil, among grain and animal fodder crops, often near the coast.

Family: *Urticaceae*

12. *Parietaria lusitanica* L. (**P.1**)

MALTA - H'Attard area: Trejġet ir-Regin (17-3-2008) - Marfa peninsula: Rdum il-Qawwi, rocks below il-Minzel ta' Piswella (25-5-2008) - Ras il-Pellegrin (7-4-2008).

GOZO - il-Munxar area: Wied tal-Għawdxija (30-11-2007) - ix-Xaghra area: ta' Fogħtier / taħt in-niċċa (24-11-2007) - very abundant in boulder screes and old rubble walls at iż-Żewwieqa, il-Hawlija, iż-Żebbuġ, tal-Bombli (7-12-2007), up to below il-Wied ta' Rdum (opposite il-Ġebbla tal-Halfa) (27-1-2008) (*possibly the largest and most extensive population in the country*).

13. *Urtica pilulifera* L.

MALTA - frequent along roads and country-lanes at Bubaqra, in-Nigret area (2002) - Hal Far area: ta' Rikka (15-3-2005), Triq Hal Far (between iż-Żurriq and tal-Baqqari) (20-12-2002), Wied Moqbol / Wied Brandina (20-3-2004) - Hal Għargħur: Triq iż-Żellieqa (5-4-2000)* - Wied Qirda, Wied il-Kbir valley system (1992) - Xrobb l-Għaġin (1) (12-3-2003).

Family: *Juglandaceae*

14. *Juglans regia* L.

MALTA - il-Kunċizzjoni (overlooking Wied il-Hmar and tas-Santi) (27-8-1996) (*These trees have trunks as massive as those of the oaks at Ballut tal-Wardija and could be of great antiquity*) - Ġnien Fieres (late 1990's).

Family: *Aizoaceae*

15. *Mesembryanthemum crystallinum* L.

MALTA - Marsascale: on coast alongside Triq is-Salini (2003) - Pembroke coast (late 1990's) - Tigne (early 1990's).

GOZO - ir-Ramla l-Hamra sand dunes (2) (1995)*; under *Tamarix* trees adjacent to ir-Ramla l-Hamra sandy beach (9-4-2008) - Santa Luċija / il-Kerċem area: along road between ta' Klula up to Wied Sansun (5-4-2004).

Family: *Caryophyllaceae*

16. *Silene fruticosa* L.

GOZO - Mgarr ix-Xini (12-1992).

Family : *Polygonaceae*

17. *Fallopia convovulus* (L.) L.A.Love

MALTA - il-Baħrija area: ta' Namura (30-5-2008) - fields around il-Ballut tal-Wardija (22-5-2008) - ħad-Dingli: is-Sienja (17-6-2008) - Ġnien il-Kbir (28-5-2008) - il-Girgenti area: l-Għajn il-Kbira (11-2003) - il-Mosta: Triq Wied is-Sijr (15-6-2008) - ir-Rabat area: Ġnien Fieres (31-5-2008); ta' Koronja (2003) - San Martin (22-5-2008) - Wied Gerżuma (30-5-2008) - Wied il-Luq (28-5-2008).

Grows in cultivated fields with deep soil.

18. *Persicaria glabra* (Willdenow) M.Gomez

MALTA - Wied il-Ħzejjen (2002).

GOZO - Wied Sara (10-6-2008).

19. *Persicaria lanigera* (R.Brown) Sojak

GOZO - Wied il-Għasri (30-9-2000) - Wied Sara, Wied tal-Grazzja valley system (10-1992).

20. *Persicaria senegalensis*

MALTA - l-Għajn il-Kbira, il-Girgenti valley system (1992) - il-Mosta area: Wied ta' San Pawl tal-Qliegħi, Wied Ħanżira valley system (1999).

Family: *Plumbaginaceae*

21. *Plumbago europaea* L. (P.1)

MALTA - is-Sigġiewi area: Triq l-Imwieġel (11-10-2007); Blat il-Qamar (8-11-2007) - Wied Qannotta (1998) - plane between Wied Qirda and Wied Ħanżir (23-5-2008).

Family: *Brassicaceae*

22. *Cardamine hirsuta* L.

MALTA - il-Buskett: Verdala (late 1990's) - l-Ghar ta' San Brinkat (vicinity of Wied Anġlu) (late 1990's) - Wied il-Ghasel area: Wied is-Sijr, l-Ghadira (2001).
GOZO - il-Munxar area: Wied tal-Għawdxija (30-11-2007).

A frequent weed of potted plant nurseries; very rare in non-anthropogenic habitats, where it grows on well shaded damp rocks.

23. *Lepidium graminifolium* L.

MALTA - ir-Rabat area: il-Fiddien, Wied il-Qliegħa valley system (3-2001); l-Gheriexem, near iċ-Ċimiterju ta' Santa Margerita and Roman Villa, is-Saqqajja, Triq it-Tigrijiet (late 1990's); along uphill road between ir-Rabat and il-Bahrija (late 1990's); Wied ta' Ġnien Hira (late 1990's).

Common in Gozo; hence no records are given.

Grows mainly along roadsides in urban areas and country lanes, rarely in wet valleybeds.

24. *Nasturtium officinale* R.Brown

MALTA - il-Bahrija area: several places including ta' Namura, tas-Sarena, valleybed between il-Qliegħi and tat-Tulliera, Wied il-Mielah (8-1992) - il-Fiddien, Wied il-Qlejgha valley system (1992) - Ġebel id-Dwejra, Ġnien Hira, il-Qattara, start of Wied il-Hemsija valley system (late 1990's) - l-Imtahleb area: Wied ta' Markozz (1992) - il-Mellieħa area: Ghajn Hadid (14-3-2000) - San Martin (7-1992) - Wied tal-Ġnejna / Wied taċ-Ċercura (1992) - Wied Ghajn Mula (13-4-2002) - Wied tal-Ħmar (vicinity of tas-Santi) (27-8-1996) - Wied il-Luq (1992); at meeting point between Wied il-Luq and Wied tal-Girgenti (1995).

GOZO - id-Dwejra area: il-Qattara (7-1993) - l-Imġarr area: il-Ġnien (early 1990's) - Wied tal-Lunzjata, Fontana valley system (29-7-1994) - Wied tas-Sasis / Wied tal-Petroċilju, Wied il-Għasri valley system (30-9-2000).

25. *Neslia apiculata* Fischer, Mayer & Ave-Lallemont (**P.1**)

GOZO - il-Qala area: ta' Cassar, ta' Simar (plateau overlooking Wied is-Simar) (19-2-2008).

26. *Sinapis arvensis* L.

MALTA - l-Ahrax tal-Mellieħa area: il-Qatgħa ta' Plegg (12-3-2008) - il-Bahrija area: ta' Xafura (overlooking Fomm ir-riħ bay) (c.2001) - Fort Bengħisa area: tal-Ħarrub (2002) - Ghajn Tuffieħa area: it-Tafal (21-5-2008) - il-Mellieħa area: il-Qortin (facing il-Manikata) (31-1-2007); between it-Torri l-Aħmar and *acacia* wood below (13-6-2003); between it-Torri l-Aħmar and Triq Ghajn Tuta (2-9-2004) - on il-Magħtab refuse dump debris (9-11-2003) - Wied ta' Kandja (2000) - Wied is-Sewda (13-8-2007) - Wied Żnuber (13-3-2004).

Common in Gozo; hence no records are given. Infrequent in Malta.

27. *Rapistrum rugosum* (L.) Allioni (**P.1**)

MALTA - Dingli cliffs area: il-Faqqanija quarries (2-6-2008) - il-Girgenti area: Ċens Mota (2-6-2008).

Family: *Malvaceae*

28. *Lavatera trimestris* L.

MALTA - fields between il-Ballut tal-Wardija and Ghajn Istars, Wied tal-Pwales (22-5-2008) - il-Buskett (30-3-2004) - Ġnien il-Kbir (28-5-2008) - Ġnien is-Sultan (31-5-2008) - l-Imtarfa area: Ġebel id-Dwejra (late 1990's) - ir-Ronzija (?) (between tal-Virtu and Wied l-Isqof) (28-5-2008) - Wied il-Ħmar (vicinity of Tas-Santi) (c. 2000) - Wied ir-Rum (1994).

Family: *Euphorbiaceae*

29. *Andrachne telephioides* L.

MALTA - l-Aħrax tal-Mellieha area: fields near it-Telgħa tal-Aħrax (12-3-2008) - ħ'Attard (17-3-2008) - Bubaqra area: il-Bur ta' l-Imtoli (24-6-2003) - around Ġebel Ciantar quarries (2-6-2008) - Ġnien il-Far hamlet (overlooking il-Buskett) (18-2-2008) - Ġnien Ingraw (early 1990's) - ta' Glidi (between l-Imnajdra Temple and it-Torri tal-Hamrija) (14-2-2008) - l-Imdawwra (overlooking Wied il-Bassasa) (18-10-2007) - l-Imġarr area: il-Ħawlija (7-3-2008) - frequent at il-Kappara, San Ġwann tal-Għargħar area (1991), including Wied Għolliqqa (1991)* - il-Mosta area: Triq il-Beżbiżija (2008) - ir-Rabat area: Triq il-Buskett (early 1990's) - San Martin (7-1992).

Usually found between street pavement cobblestones in urban areas and country lanes, occasionally in cultivated fields, rarely on rocks.

30. *Euphorbia aleppica* L. (P.1)

MALTA - Dingli cliffs area: in fields between Bejtet il-Fenek and ta' Sabbgħat (9-6-2008).

Family: *Crassulaceae*

31. *Sedum caespitosum* (Cavanilles) DC. (P.1)

MALTA - il-Baħrija area: Wied il-Mielah, Ras ir-Raheb clifftops (overlooking Fomm ir-Riħ) (30-5-2008) - l-Aħrax tal-Mellieha area: il-Madonna ta' l-Aħrax (19-4-2008) - ix-Xagħra ta' Lawrenti (overlooking Buskett) (18-2-2008).

GOZO - taċ-Ċawl coastal rocks (17-4-2008) - il-Munxar area: Ras il-Fekruna (10-4-2008); karstland between il-Munxar and Wied tal-Għawdxija (10-4-2008) - ta' Sannat area: il-Qortin / Saguna cliffs (11-1-2008) - tal-Bardan (5-3-2008).

32. *Sedum litoreum* Gussone

MALTA - l-Għallis coastline (early 1990's) - Wied id-Dis (5-4-2000).

GOZO - taċ-Ċawl coastal rocks (17-4-2008).

33. *Sedum stellatum* L. (P.1)

MALTA - Wied il-Għasel area: rocks close to the meeting point of Wied is-Sijr and Wied il-Għasel (11-3-2008).

Family: *Rosaceae*

34. *Potentilla reptans* L.

MALTA - il-Bahrija area: valleybed between tat-Tulliera and il-Qliegħi (1992) - il-Fiddien (c.2001) - Ġnien il-Kbir (1992) - l-Imtahleb area: il-Bruka (1992) - ir-Rabat area: l-Gheriexem (late 1990's) - San Martin (7-1992) - Wied tal-Ġnejna / Wied tač-Čerčura (2-1992) - Wied Gerżuma (1992) - Wied Hażrun (1992) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied il-Hesri (1992) - Wied il-Luq, Wied tal-Girgenti, Triq tal-Girgenti valley system (*possibly the largest population in the country*) (1992) - Wied Qirda, Wied il-Kbir, il-Marsa valley system (1992).

GOZO - Daħlet Qorrot (2-1993) - in a semi-permanent waterhole in the interior of Mgarr ix-Xini (12-2005) - Wied ir-Riħan (24-4-2003).

35. *Rosa sempervirens* L.

MALTA - il-Girgenti area: scree around Inquisitor's Palace (late 1990's) - is-Salib tal-Għolġa area: scree overlooking Wied il-Fulġia (11-2005) - San Ġwann area: Wied Ġhomor (1995) - Wied Anġlu (early 1990's) - Wied Hażrun (1992).

Family: *Fabaceae*

36. *Anagyris foetida* L. (**P.1**)

MALTA - Ġnien il-Far (overlooking Buskett) (25-3-2008).

37. *Astragalus sesameus* L.

MALTA - Laroka plateau (overlooking Buskett) (12-2-2008) - next to l-Imtahleb church (1) (5-4-2003) - in-Nigret area (South Malta): ix-Xaġħra ta' Sur Anġla karstland, then occurring intermittently downhill to il-Munqar (8-4-2003) - Ras il-Pellegrin (7-4-2008).

GOZO - ič-Čittadella: St. John's Demibastion (17-2-2004) - ta' Ġordan hilltop (20-3-2008) - in-Nadur area: ix-Xaġħra tat-Torri ta' Sopu (overlooking Rdum il-Kbir) (23-4-2003) - ta' Sannat area: il-Qortin / Saguna cliffs (5-3-2008).

Past literature records this species as "abbastanza frequente ...Gozo, in molti luoghi" (Sommier & Caruana Gatto 1915) "frequent" (Haslam et. al. 1977). For this reason, records for this species were not kept by the author prior to the year 2003. It was then noticed by Mr. E. Lanfranco to have declined dramatically and to have become infrequent. It thus became advisable to record localities where it occurs.

38. *Coronilla valentina* L.

MALTA - between il-Ballut tal-Wardija and San Martin (7-1992) - Dingli cliffs area: Rdum ta' Hurrieqa, il-Wardija (1995) - l-Imtahleb area: between Għar Ilma and ta' Liska hamlet (early 1990's) - Rdum Majjiesa (5-2000) - Wied Babu area: Wied Babu, including ix-Xaqlib tax-Xrika, Salib il-Wied, near il-Blata ta' Qančula (1991); Taħt il-Munqar (3-2000) - rocky terraces overlooking Wied Babu (below il-Hotba) (3-2000) - Wied Anġlu (early 1990's) - Wied il-Bassasa (in il-Barriera tal-Boqq) (3-2000) - Wied Qirda (1992).

GOZO - in-Nadur area : Ta' Hida (?) (a scree on the West side) (27-4-1998) - Ta' Čenč area: ta' Čenč cliff-edge (1992) - ix-Xaġħra area: il-Pergla ž-Žġħira / il-Pergla ta' Majsi (21-11-2006); is-Sisien (point on the perimeter of il-Qortin plateau refuse dump facing Marsalforn) (21-3-2004).

39. *Hymenocarpus circinnatus* (L.) Savi

GOZO - ta' Sannat area: il-Qortin / Saguna cliffs (5-3-2008).

40. *Lathyrus cicera* L. (P.1)

MALTA - l-Aħrax tal-Mellieħa area: ix-Xewkija (6) (12-3-2008) - rocky terraces overlooking Wied Babu (below il-Ħotba) (16-1-2008) - Wied il-Bassasa (3-2000) - Wied Mejxu (1995) - karstland between ix-Xemxija heights and il-Mizieb woodland (5) (28-1-2007).

41. *Medicago lupulina* L.

MALTA - Laroka plateau (overlooking il-Buskett) (4-2008) - Mgarr area: ix-Xagħra taż-Żingier (3-2007) - il-Wardija area: behind Palazzo Gauci (25-4-2007) - Wied il-Għasel area: between il-Knisja tal-Għar and turning pint to Misraħ Ġhonoq (4-2002) - ix-Xagħra tat-Tombu (near l-Imselliet school) (13-4-2002).

M. lupulina was recorded in the past as: “ **Malta e Gozo, commune !** ” (*Sommier & Caruana Gatto 1915*); “common” (*Haslam et al. 1977*). Seems to have declined dramatically.

42. *Medicago marina* L.

MALTA - ir-Ramla tal-Mellieħa (3) (early 1990's)* - ir-Ramla tal-Mixquqa / ir-Ramla ta' Snien / Golden Bay (1991).

GOZO - ir-Ramla l-Ħamra (1992) (*the largest surviving population*).

43. *Medicago monspeliaca* (L.) Trautvetter (P.1)

MALTA - l-Aħrax tal-Mellieħa area: il-Qatgħa ta' Pleġġ (12-3-2008) - Ġnien il-Far (overlooking il-Buskett) (25-3-2008) - il-Mistra area: ix-Xagħra tal-Qortin (12-3-2003) - ta' Glidi (between Mnajdra temple and it-Torri tal-Ħamrija) (14-2-2008) - Ras il-Pellegrin (7-4-2008) - slopes overlooking Wied Babu, below il-Ħotba (16-1-2008) - Wied il-Ħesri (11-10-2007) - iż-Żebbiegħ (13-4-2002).

GOZO - ta' Għammar hill (20-3-2008) - ta' Ġordan hill (20-3-2008) (*possibly the largest Gozo population*) - il-Qala area: il-Ħotba (plateau overlooking Triq iċ-Ċawl downhill country road) (19-2-2008); ta' Cassar, ta' Simar (plateau overlooking Wied is-Simar) (19-2-2008); ta' Rdum clays (opposite il-Ġebbla tal-Ħalfa) (11-4-2008) - iż-Żewwieqa (11-4-2008).

44. *Ononis ornithopodoides* L. (P.1)

MALTA - il-Buskett area: Verdala (14-1-2008) - il-Mellieħa area: at the turning point between Wied tal-Madonna and Għajn Żejtuna (21-1-2008) - in a disused quarry at Wied Magħlaq (16-1-2008) - between ix-Xemxija heights and il-Mizieb woodland (28-1-2008).

GOZO - ix-Xagħra area: tal-Gabdol (on perimeter of il-Qortin refuse dump, overlooking il-Pergla) (12-2007) - very abundant on boulders at iż-Żewwieqa, il-Ħawlija, iż-Żebbuġ, tal-Bombli (7-12-2007) up to the scree at the mouth of Wied ta' Rdum (opposite il-Ġebbla tal-Ħalfa) (27-1-2008) (*possibly the largest and most extensive population in the country*).

45. *Trifolium fragiferum* L.

MALTA - l-Imtarfa area: it-Telgħa ta' Slampa (early 1990's) - Wied ta' l-Imselliet (13-4-2002) - Wied il-Qlejgħa (c.2001).

GOZO - id-Dwejra area: Wied tal-Port (26-3-2003) - Ghajn Għabdun (21-10-2006) - il-Kerċem area: ix-Xejriet (hill opposite facing Ghajn Għabdun) (12-6-2008) - Wied Marsalforn (10-1992) - Wied is-Sabbara (26-1-2008) - Wied tas-Sasis, Wied il-Għasri valley system (30-9-2000) - Wied ta' Xhajma (5-4-2006).

46. *Trifolium tomentosum* L.

MALTA - l-Aħrax tal-Mellieħa area: is-Sur ta' l-Aħrax (7-6-2008) - Dingli cliffs area: Rdum ta' Għar Bittija (16-6-2008) - around Gebel Ciantar quarries (2-6-2008) - is-Salib tal-Għolja area: l-Imsaqqa (2-6-2008) - Wied Qirda (23-5-2008).

GOZO - ix-Xlendi valley (c.2004).

T. tomentosum was recorded in the past as: "**Malta, Gozo e Comino, comune !**" (*Sommier & Caruana Gatto 1915*); "**frequent**" (*Haslam et al. 1977*) and was as common as *Trifolium resupinatum* L. until the 1960's (*E. Lanfranco, pers.com.*). Hence no records were kept during the 1990's, until the author realised that it was no longer as common as past records indicate. Seems to have declined dramatically and is now infrequent.

47. *Vicia tenuissima* (Bieberstein) Schinz et Thellung (P.1)

MALTA - Marfa peninsula: Ghajn Tuta (25-5-2008) - Wied ta' Fomm ir-Riħ (7-4-2008) - Wied Gerżuma (30-5-2008) - Wied l-Isperanza (on a valleybed boulder) (13-5-2008).

Partial to clay soils.

Family: *Lythraceae*

48. *Lythrum junceum* Banks & Solander

MALTA - il-Baħrija area: several places including ta' Namura, valleybed between tat-Tulliera and il-Qliegħi, Wied il-Mielah (1992) - clay terraces between il-Ballut tal-Wardija and Ghajn Istas, Wied tal-Pwales (early 1990's) - il-Fiddien, Wied il-Qlejgħa (1992), il-Qlejgħa l-Kbira (14-3-2003), Wied ta' l-Armla (31-5-2008) valley system - Ġnien Hira (late 1990's) - Ghajn Tuffieħa area: clay slopes overlooking ir-Ramla ta' Ghajn Tuffieħa (1992) - l-Imtahleb area: Rdum tal-Qaws (overlooking tal-Gagħwija) (1995); Wied ir-Rummien (1992); Rdum tas-Sarg, Rdum tal-Vigarju, Wied tal-Hut, Wied ta' Ġordajna (1995) - l-Imtarfa area: it-Telgħa ta' Slampa (early 1990's) - Rdum Depiro (1995) - San Martin (7-1992) - along Triq il-Wardija (25-4-2007) - Wied l-Arkata (vicinity of il-Bidnija) (21-12-2002), Wied Ghajn Mula, Wied tal-Hzejjen, Wied ta' l-Imselliet valley system (13-4-2002) - Wied tal-Ġnejna / Wied tač-Čerčura (1992) - Wied Gerżuma (1992) - Wied tal-Halqun, Wied ta' Fomm ir-Riħ valley system (7-4-2008) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied tal-Mistra (early 1990's).

Family: *Myrtaceae*

49. *Myrtus communis* L.

MALTA - il-Ballut tal-Wardija (1) (early 1990's) - il-Girgenti, including 1 large specimen along Triq il-Girgenti (1992) - l-Imtarfa area: Santa Luċija (1) (16-1-2002) - il-Mellieħa area: Ġnien Ingraw (early 1990's) - is-Salib tal-Għolja area: scree below ta' San Lawrenz (1992) - San Martin (7-1992) - Wied Gerżuma (1992) -

Wied Hanzira (parallel to Wied Qirda) (1992) - ix-Xaghra ta' l-Isqof (overlooking Ġnien il-Kbir) (1) (1992).

Family: *Zygophyllaceae*

50. *Fagonia cretica* L.

MALTA - Il-Ġnejna area: il-Qarraba (1992); alongside Triq il-Ġnejna (close to ir-Ramla tal-Ġnejna) (1992); il-Gudja (facing Wied il-Halqun) (7-4-2008).

51. *Tribulus terrestris* L.

MALTA - area between h'Attard and Ta' Qali: Wied il-Hemsija (17-5-2008) - il-Bahrija area: near the playing field (1992)* (*the largest specimen ever observed by the author: more than 1m across*) - Birżebbuġa area: St. George's Bay (1992) - Marfa peninsula: l-Armier (early 1990's) - il-Mellieħa area (1992), including Triq il-Wied (near Ġnien Ingraw)* (6-10-2006) - il-Mosta (early 1990's) - Hal Safi (21-8-2007) - is-Siġġiewi area: near Dar il-Providenza (16-8-2007); Wied il-Hesri (20-8-2004) - Valletta, Floriana, Pieta area (1992) - Wied il-Qoton (21-8-2007).

GOZO - fields behind ir-Ramla l-Hamra sand dunes (8-1992).

Seems to be increasing as its preferred habitat, polluted dusty places, increases.

Family: *Polygalaceae*

52. *Polygala monspeliaca* L.

MALTA - Ġnien il-Far (overlooking il-Buskett) (25-3-2008) - il-Mellieħa area: Wied Hanzira (2002) - Mgarr area: ix-Xaghra taż-Żingier (7-3-2008) - karstland below Selmun, adjacent to il-Mistra (late 1990's) - Wied il-Bassasa (3-2000) - frequent on karstland stretches between ix-Xaghra tal-Borghom (overlooking l-Imtahleb), across to Wied Rini and Pupiruwa (10-4-2002) - ix-Xaghra tat-Tombu (near l-Imselliet school) (13-4-2002).

GOZO - il-Qala area: Wied ta' Rdum (19-4-2008).

Family: *Apiaceae*

53. *Apium nodiflorum* (L.) Lagasca

MALTA - h'Attard area: Wied ta' l-Irmiedi (17-5-2008), Wied il-Hemsija (17-3-2008) - il-Bahrija area: several places including ta' Namura, is-Sarena, valleybed between il-Qliegħi and tat-Tulliera, Wied il-Mielah (1992) - il-Fiddien, Wied il-Qlejgħa (1992) valley system - Ġebel id-Dwejra, Ġnien Hira, il-Qattara, start of Wied il-Hemsija valley system (late 1990's) - Ġnien il-Kbir, Ġnien iż-Żgħir, Wied ta' l-Isqof valley system (1992) - Ġnien is-Sultan (31-5-2008) - San Martin (7-1992) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992) - Wied Ġhajn Mula (13-4-2002) - Wied Hażrun (1992) - Wied il-Hmar (vicinity of tas-Santi) (27-8-1996) - Wied il-Kbir (23-5-2008) (*flourished in a pool of run-off from a recently opened mushroom farm*) - Wied il-Luq, Wied tal-Girgenti valley system (1992).

GOZO - id-Dwejra area: il-Qattara (7-1993) - Ġhajn Għabdun (21-10-2006) - Hondoq ir-Rummien area: ta' Għaroba (1997) - l-Imgarr area: il-Ġnien (early 1990's) - Wied tal-Ġhajjun (between ix-Xaghra and in-Nuffara hill) (5-4-2006) - Wied tal-Lunzjata, Fontana (including Ġhajn Tuta, Ġhajn il-Kbira, wara l-Biċċerija) Wied tax-Xlendi / Wied ta' l-Ilma valley system (29-7-1994) - Wied ta' San Blas (early 1990's) - Wied Sara, Wied

tal-Grazzja, Wied ta' Marsalforn valley system (10-1992) - Wied tas-Sasis / Wied tal-Petročilju, Wied il-Għasri valley system (30-9-2000).

Increasing and now the dominant species in most permanent watercourses due to soaring levels of nitrogenous pollution and anthropogenic disturbance. Often takes over completely after valleybeds are bulldozed.

54. *Bupleurum lancifolium* Hornemann

MALTA - fields behind Ġebel Ciantar quarries (2-6-2008) - Ġnien il-Kbir (28-5-2008) - Ġnien il-Far (vicinity of il-Buskett) (1) (25-3-2008) - il-Mellieħa area: terraces between it-Telgħa ta' Selmun and Wied il-Mizieb (27-4-2005) - l-Imġarr area: l-Iskorvit (late 1990's) - Wied Gerżuma (30-5-2008) - Wied Qirda (2) (1992) - iż-Żellieqat (overlooking Wied iż-Żurrieq) (16-1-2008).

GOZO - il-Qala area: il-Gwiedi (19-2-2008) - Ix-Xagħra area: fields around il-Qortin refuse dump (19-9-2007).

B. lancifolium was recorded in the past as: “ *Malta, non raro, ed in alcuni luoghi abbondante!* ” (*Sommier & Caruana Gatto 1915*); “ *locally frequent* ” (*Haslam et al. 1977*). For this reason, records were not usually kept prior to the year 2000. It was then noted by Mr. E. Lanfranco to have declined and was now infrequent. It thus became advisable to record localities where it occurs.

55. *Eryngium maritimum* L.

MALTA - Marfa peninsula: ir-Ramla tal-Bir (8-1992)*; ir-Ramla tat-Torri (8-1992) - ir-Ramla tal-Mixquqa / ir-Ramla ta' Snien / Golden Bay (2) (1991)*.

GOZO - ir-Ramla l-Hamra (8-1992) - ix-Xatt l-Aħmar (2) (10-1992).

56. *Oenanthe globulosa* L.

MALTA - il-Fiddien, Wied il-Qlejgħa / Chadwick lakes, il-Qliegħa l-Kbira valley system (3-2001) - Mġarr area: Wied il-Hmar (vicinity of tas-Santi) (7-3-2008) - Wied l-Isperanza, Wied il-Għasel valley system (2000).

O. globulosa was recorded in the past as: “ *frequente* ” (*Sommier & Caruana Gatto 1915*); “ *frequent* ” (*Haslam et al. 1977*); and was found in all permanent watercourses until the 1960's (*E. Lanfranco pers.com*). Seems to have declined dramatically.

57. *Pseudorlaya pumila* (L.) Grande

GOZO - ir-Ramla l-Hamra (6) (1995)*.

Not seen again after the above mentioned date; may be extinct.

Family: *Rhamnaceae*

58. *Zizyphus zizyphus* (L.) Meikle

MALTA - l-Imtahleb area: Wied ta' Għar Ilma (early 1990's) - Wied ta' Bingemma / il-Ġnien ta' Bingemma (3-11-2007).

GOZO - Dahlet Qorrot (2-1993) - ta' Għammar hill flanks (9-11-2006).

Family: *Sambucaceae*

59. *Sambucus ebulus* L.

MALTA - Ġnien il-Kbir, Ġnien iż-Żgħir (vicinity of Wied ta' l-Isqof) (1992) - ir-Rabat area: Ġnien Fieres (2001).

GOZO - Fontana area: Wara l-Biċċerija, ir-razzett tal-Għajn il-Kbira (29-7-1994).

60. *Sambucus nigra* L.

MALTA: il-Ġnejna valley: il-Ġnien (1) (2-1992) - Ġnien Għajn Tuffieħa (1) (13-2-1995) - l-Imtarfa area: Sant Alessio (2) (6-5-1996) - Wied il-Ħesri (1) (early 1990's) - Wied Liemu (1) (late 1990's) - iż-Żejtun area: Triq Marsaxlokk (1) (10-2003).

GOZO - Fontana area: Wied ta' Siekel (1) (29-7-1994) - l-Għasri : Triq il-Fanal (1) (6-12-1996); Wied tas-Sasis / Wied tal-Petroċilju (1) (18-2-2002) - ix-Xagħra: at a corner between Triq it-Tigrija and Triq Marsalforn (1) (late 1990's); il-Pergla (21-3-2004) - iż-Żellieqa (overlooking ix-Xlendi) (2) (1994).

Unlikely to be indigenous. Formerly much cultivated for its medicinal properties. Always found near old farmsteads.

Family: *Valerianaceae*

61. *Centranthus calcitrapae* (L.) Dufresne

MALTA - l-Aħrax tal-Mellieħa area: l-Aħrax ta' Ġewwa (*unusually growing along a roadside*) (19-4-2008) - Marfa Peninsula: boulder screes between il-Minzel ta' Ruman / il-Minzel tar-Rixtellu and ta' Qassisu (4-2007); Rdum il-Qawwi, rocks below il-Minzel ta' Pisswella (25-5-2008) - Ras il-Pellegrin (7-4-2008) - Wied Żnuber (27-2-2004) - Wied il-Għasel (11-3-2008).

GOZO - Mgarr ix-Xini (12-2005) - ix-Xagħra area: Għajn Barrani, Rdum tas-Surgu, Rdum ta' Kilulu (21-3-2004) - Rdum il-Kbir (vicinity of San Blas) (2003) - iż-Żewwieqa (23-2-2008).

62. *Centranthus ruber* (L.) DC.

MALTA - h'Attard: on old walls near Triq Sant Antnin (17-3-2008).

GOZO - on an escarpment at Wied tal-Għattuq (22-11-2007).

Frequently cultivated as a pot plant in the past. It is thus difficult to ascertain whether the wild plants found are truly indigenous or long naturalized. However the Gozo population may be autochthonous since it is growing in its typical phytocoenosis: a limestone escarpment, among native garrigue vegetation.

Family: *Convolvulaceae*

63. *Calystegia sepium* (L.) R.Brown

MALTA - in fruit orchards and among thickets at San Martin (3-2000).

GOZO - among a stand of *Arundo donax* behind ir-Ramla l-Hamra sand dunes (19-7-2006).

64. *Calystegia silvatica* (Kitaibel) Grisebach

MALTA - ħ'Attard area: in a *Bougainvillea* hedge at San Anton gardens (17-3-2008); Wied ta' l-Irmiedi (17-5-2008); Wied il-Hemsija, Wied ta' Ċampira valley system (17-3-2008) - in fruit orchards and among reeds at Ġnien il-Kbir (1992) - Wied il-Luq (*Confined to il-Buskett area in 1992; spread to Girgenti borehole by 28-5-2008*) - Wied ta' l-Imsida (1992).

GOZO - l-Ghasri area: Wied tas-Sasis / Wied tal-Petroċilju (10-6-2008).

65. *Calystegia x lucana* (Tenore) G.Don

MALTA - in orchards and among reeds at Ġnien il-Kbir (1992) - in orchards and among thickets at San Martin (3-2000) - Wied l-Isperanza, Wied il-Ghasel valley system (2001) (*Only 2 specimens were seen in 2001. But by 12-11-2006, much of the valleybed was colonized, climbing shrubs like Rubus ulmifolius and Ricinis communis*) - Wied il-Luq (1992) (*Confined to il-Buskett area in 1992; spread as far as Girgenti borehole by 28-5-2008*).

Calystegia sp. pl.were recorded in the past as: "**Malta**, raro, trovato soltanto a Ġnien il Gbir! e al Boschetto (Borg) " (*Sommier & Caruana Gatto 1915*); "*endangered* "(*Lanfranco 1989*). They seem to be currently increasing and spreading rapidly. This may be due to an increase in suitable habitat: well shaded places with hedges and reeds for twining climbing stems. Most valleybeds are now dominated by extensive dense stands of *Arundo donax*, since such reeds are rarely harvested nowadays. Dense thickets of *Rubus ulmifolius* are also common since firewood is no longer collected and grazing has greatly diminished. *Ricinus communis*, an alien shrub with tall stems, has now infested most valleybeds too. Also, today farmers have much less time for weeding orchards.

Family: *Boraginaceae*

66. *Echium sabulicola* Pomel

GOZO - abundant on cliff-tops between tal-Bardan, il-Qortin / Saguna cliffs (ta' Sannat area), Ta' Ċenċ area to Wied is-Sabbara (1993), sometimes forming extensive meadows.

Family: *Lamiaceae*

67. *Ballota nigra* L.

MALTA - il-Bahrija area (1992) - Birkirkara area: alongside Triq Mannerino (1992)*; an unbuilt plot alongside Triq il-Kan.Indri Galea (2006) - Blata l-Bajda: an unbuilt plot alongside Triq l-Ispartani (1991)* - Ġnien Ghajn Tuffieha (14-5-1996) - Gwardamangia: near St. Luke's hospital entrance (1992)*; behind Junior College Upper Lyceum (1992)* - Ghajn Hamiem watercourse (vicinity of l-Imtarfa station) (late 1990's) - l-Imtahleb area: il-Frajna (1992) - il-Pieta: outside Ta' Braxia Cemetery back gate (late 1990's) - San Ġwann area: alongside Vjal ir-Riħan (15-6-2008) - Wied Balluta (1991) - Wied tal-Buskett, Wied il-Luq, Wied tal-Girgenti, Ghajn il-Kbira valley system, also near Girgenti borehole (1992) - Wied Qirda, Wied il-Kbir valley system (1992) - University of Malta campus (1991).

GOZO - Dahlet Qorrot (2-1993) - Fontana area: Wara l-Biċċerija (29-7-1994) - l-Ghasri: a lane branching from Triq il-Fanal (2-2002)* - Hondoq ir-Rummien area: ta' Gharoba (1997) - l-Imġarr (early 1990's) - along uphill road from l-Imġarr to in-Nadur (19-7-2006) - il-Pergla (5-1994) - under olive trees along road between ta' Sannat and taċ-Ċawla (ir-Rabat area) (11-1-2008) - Wied tal-Ghattuq (22-11-2007) - Wied ta' Marsalforn (1) (16-10-2002) - along Wied ir-Riħan road (20-6-2005) - Wied tax-Xlendi (1994) - ix-Xagħra area: Ghajn Xejba (late 1990's) - ix-Xewkija area: Wied Hanzira (1993).

68. *Melissa officinalis* L.

MALTA - il-Bahrija area: in an citrus fruit orchard at ta' Żinzla (1-11-1996)* - il-Mellieha area: Ġhajj Hadid (14-3-2000).

GOZO - abundant along the watercourse at Wied tal-Ghattuq, Wied tal-Għażien (22-11-2007).

Unlikely to be indigenous; probably an archeophyte. Formerly much cultivated by apiarists as crushed leaves were used to attract honeybee swarms into pottery jars.

69. *Phlomis fruticosa* L.

MALTA - il-Girgenti area: tal-Palazz (12-2005) - Għar Lapsi area: Wied ta' l-Ilsna, ix-Xagħra ta' Għar Lapsi (14-2-2008) - Hal Qormi area: Wied il-Kbir (early 1990's) - Hoffret ir-Rizz and surrounding karstland (18-3-2004) - il-Mellieha area: Ġnien Ingraw (early 1990's); Ġhajj Żejtuna (early 1990's) - Wied Anġlu (early 1990's) - Wied il-Faħam (early 1990's) - Wied il-Għasel (1993) - Wied il-Hesri (1992) - Wied il-Magħlaq (early 1990's) - Wied Qirda (1) (1992) - ix-Xagħra ta' Bingham (plateau opposite PaleoChristian tomb necropolis) (3-11-2007) - ix-Xagħra ta' Żingier (overlooking Ġnien Ġhajj Tuffieha) (3-2007).

70. *Rosmarinus officinalis* L.

MALTA - il-Buskett area: Verdala (late 1990's) - Had-Dingli area: tal-Wata; Hal Tartarni (late 1990's) - Dingli cliffs area (*possibly the largest population in the country*): abundant on boulder scree and escarpments below Madalena chapel: Rdum ta' Ġhajj Gidem, Rdum tal-Madliena, Rdum Dikkiena (early 1990's); also abundant on the karstic plateau around Madalena Chapel and Bejt il-Fenek, including il-Munxar, tan-Newma, il-Hotba, il-Faqqanija (early 1990's) - il-Girgenti area: escarpments between il-Girgenti and Inquisitor's Palace (early 1990's) - l-Għallis area: Xagħret Franklin, l-Għallis ta' Ġewwa, il-Għoqod, ix-Xagħra tal-Baħar (7-1993) - Ġhajj Żejtuna (early 1990's) - Għar il-Kbir area: rocky slopes between Clapham Junction cart ruts and Wied ix-Xagħri (1) (late 1990's); rocky stretches between Għar il-Kbir, ta' Sabbgħat and il-Faqqanija quarries (late 1990's) - l-Imġarr area: id-Daħar (c.2003) - rocks across the road from l-Imselliet school (26-10-2006) - l-Imtaħleb area: Għar Ilma (early 1990's) - between il-Miżieb wood and Wied tal-Kalkara (26-5-2005) - ir-Rabat area: ix-Xagħra tas-Sintini (vicinity of ta' Koronja) (17-3-2004) - is-Salib tal-Għolja area: l-Imsaqqa (late 1990's) - San Ġwann area: Wied Ghomor (1995) - San Martin (7-1992) (P?) - Wied Babu (1991) - rocky terraces overlooking Wied Babu (below il-Hotba) (3-2000) - Wied Balluta (1991) - Wied il-Bassasa (3-2000) - Wied Gerżuma (1992) - Wied Għar Dalam (3-10-2003) - Wied Hażrun (1992) - Wied Qirda (1992) - Wied Rini (1992) - Wied Xkora (3-2000) - Wied Żnuber (3) (1995) - ix-Xagħra tal-Isqof (overlooking Ġnien il-Kbir) (8-1992) - iż-Żellieqat (overlooking Wied iż-Żurrieq) (16-1-2008).

GOZO - Iż-Żewwieqa area: iż-Żebbuġ (1) (23-2-2008) (*The only autochthonous Gozo population known to the author*).

71. *Stachys ocymastrum* (L.) Briquet (P.1)

GOZO - ta' Għammar hill clay flanks (20-3-2008).

72. *Teucrium scordium* L.

MALTA - il-Bahrija area: valleybed between il-Qliegħi and tat-Tulliera (1992)*.

Population suddenly reduced to 1 clump in 1996, then completely wiped out in the late 1990's when a mass of dead Arundo donax reeds heaped up in the valleybed, smothering watercourse vegetation. Now extinct in the

wild. The author has conserved the species by cultivating it in his own private garden from seeds and rhizome cuttings collected at il-Bahrija.

73. *Vitex agnus-castus* L.

MALTA - il-Bahrija area: Ġnien in-Niegra (1992) - Ghajn Żejtuna (1) (early 1990's) - l-Imtahleb area: Wied ta' Għar Ilma (1) (early 1990's)* - Rđum Majjiesa (1) (5-2000) (shown to the author by Eman Calleja) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992).

GOZO - id-Dwejra area: valleybed between il-Qattara and il-Qawra / Inland Sea (7-1993); Wied tal-Port (1) (26-3-2003) - l-Imġarr area: Taht ta' l-Erbgħa / ta' Setgħer (7-1992) - Mġarr ix-Xini (12-1992) - il-Qala area: Hondoq ir-Rummien area, including ta' Għaroba (1997); Wied tal-Marġa (1997); Wied ta' Rđum (18-4-2005) - ir-Ramla l-Hamra, Wied ta-Ramla (8-1992) - San Blas (1993) - Wied Biljun (late 1990's) - Wied il-Lunzjata, Fontana valley system (29-7-1994) - Wied ta' Marsalforn, Wied tal-Grazzja (10-1992), Wied tal-Għażien, Wied tal-Għattuq (22-11-2007) valley system - Wied ta' Xhajma (5-4-2006) - ix-Xagħra area: il-Pergla, Ghajn Barrani, Rđum tas-Surgu, Rđum ta' Kilulu (5-1994); Rđum ta' Sekek (21-3-2004) - iż-Żewwieqa (including 1 hypochromatic specimen) (late 1990's).

COMINO - Santa Marija bay (9-1992).

Family: *Solanaceae*

74. *Lycium intricatum* Boissier

MALTA - l-Ahrax tal-Mellieħa area: Rđum il-Hmar, l-Ahrax ta' Ġewwa, il-Qatgħa ta' Plegg, tax-Xilep (12-3-2008) - Had-Dingli area: Hal Tartarni (late 1990's) - il-Magħtab (late 1990's) - il-Mellieħa area: Ġnien Ingraw (7) (2000) - il-Wardija area: alongside Triq il-Wardija (25-4-2007).

GOZO - ta' Cassia (between id-Dabrani and is-Salvatur hills) (13-3-2003) - flanks of il-Qolla s-Safra (11-3-2003).

Family: *Scrophulariaceae*

75. *Kickxia elatine* (L.) Dumortier (P.1)

GOZO - id-Dwejra area: Wied ta' Kerrex, Wied ta' l-Abatija (12-6-2008) - abundant at l-Ehbiel (fields along highway between Tal-Hniena, ix-Xewkija, and it-Torri, Ghajnsielem) (10-6-2008) - Ghajnsielem area: fields along Triq il-Qieghħan (27-6-2008) - il-Kerċem area: ix-Xejriet (hill opposite facing Ghajn Għabdun) (12-6-2008) - fields alongside Triq l-Għarb (12-6-2008) - Wied Marsalforn (4-6-2008).

Frequent in Gozo; rare in Malta. Usually grows in wheat fields, flourishing after the harvest, during early Summer.

76. *Kickxia commutata* (Bernhardt) Fritsch

MALTA - Wied Babu (1992) - Wied Qirda (1992).

Unlike other *Kickxia* present in the Maltese islands, *K.commutata* does not grow in cultivated fields but in dry valleybeds.

Recorded in the past as: " abbastanza frequente " (Sommier & Caruana Gatto 1915); " locally frequent " (Haslam et al. 1977). In the author's experience, it is now much rarer than these literature references indicate.

77. *Linaria pseudolaxiflora* Lojacono (P.1)

GOZO - abundant on clifftops along il-Qortin / Saguna cliffs (ta' Sannat area), tal-Bardan, Sanap cliffs (il-Munxar area) (5-3-2008) (possibly the largest population in the country) - ta' Ghammar hilltop (20-3-2008) - ta' Ġordan hilltop (20-3-2008).

Frequent in Gozo; very rare in Malta.

78. *Veronica anagallis-aquatica* L.

MALTA - il-Bahrija area: several places including ta' Sarena, valleybed between il-Qliegħi and tat-Tulliera, Wied il-Mielah (8-1992) - il-Fiddien, Wied il-Qlejgha / Chadwick lakes valley system (1992) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992) - Wied Gerżuma (1992) - Wied il-Ħmar (vicinity of Tas-Santi) (27-8-1996) - Wied ta' l-Isqof (1992) - Wied il-Kbir (23-5-2008) (flourished in a pool of run-off from a recently opened mushroom farm) - Wied il-Luq, Wied tal-Girgenti valley system (1992).

GOZO - Hondoq ir-Rummien area: ta' Gharoba (1997) - l-Imġarr area: il-Ġnien (early 1990's) - Wied il-Għasri (30-9-2000) - Wied ta' San Blas (early 1990's).

Family: *Orobanchaceae*

79. *Orobanche cernua* Loeffling

MALTA - Marsascala: coastline along Triq is-Salini (2003) - rocks opposite St. Paul's Islands (1) (early 1990's).

GOZO - Marsalforn area: il-Mielħa (4-6-2008) - il-Munxar area: Sanap cliffs (5-3-2008) - ta' Rdum (opposite il-Ġebba tal-Halfa) (12-4-2008).

COMINO - l-Għamieri peninsula (early 1990's).

80. *Orobanche densiflora* Salzmann f. *melitensis* Beck

MALTA - l-Aħrax tal-Mellieħa area: il-Ponta tal-Bir, ta' Tutti, it-Torri tal-Qortin it-Twil, ta' Makka, l-Għar tal-Għasafar, is-Sur ta' l-Aħrax, around it-Torri l-Abjad, il-Bieb tal-Għar, tax-Xmajjar, between l-Aħrax tar-Ramal and il-Wied tar-Ratal, tax-Xilep, Rdum il-Ġriewi (early 1990's) - il-Mellieħa area: Ġnien Ingraw (2001); il-Ħalqun ta' San Diklaw (2001); ir-Ramla tal-Mellieħa (early 1990's); rocks around it-Tunnara museum (4-2007); Wied tal-Madonna (18-9-2006) - between il-Mistra bay and rocks facing St. Paul's Islands (1) (12-3-2003) - Qalet Marku peninsula (29-4-1993) - Wied il-Għasel area: between il-Knisja tal-Għar and turning point to Misraħ Ghonoq (1) (4-2002).

81. *Orobanche hederæ* Duby

MALTA - abundant at San Anton Gardens (early 1990's) - Wied Harq Hamiem (1) (1995) (shown to the author by Darrin Stevens).

82. *Orobanche lavandulacea* Reichenbach (P.1)

MALTA - Dingli cliffs area: il-Wardija (16-6-2008) - boulder screes on clay slopes overlooking ir-Ramla ta' Ghajn Tuffieħa (5-4-2008) - Ras il-Pellegrin (7-4-2008).

Family: *Plantaginaceae*

83. *Plantago major* L.

MALTA - l-Argotti Botanic Gardens (1992) - il-Bahrija area: several places including valleybed between tat-Tulliera and il-Qliegħi, tas-Sarena (8-1992)* - il-Fiddien (c.2001) - Ġebel id-Dwejra olive grove (late 1990's) - Ġnien il-Kbir (1992) - Ġhajn Tuffieħa area: il-Ġnien, around Roman baths, il-Wied tal-Ġinna (13-2-1995) - l-Imtahleb area: Wied ta' Markozz, along road leading to ta' Pajpurijiet (1992) Rdum tas-Sarg, Rdum tal-Vigarju, Wied ta' Ġordajna (1995) - il-Mellieħa area: Ġhajn Ħadid (14-3-2000) - l-Imtarfa area: Santa Luċija (16-1-2002) - ir-Rabat: it-Telgħa tas-Saqqajja (1) (c.2004)* - San Ġiljan: it-Telgħa ta' San Ġiljan (1) (4-2007) - San Martin (7-1992) - Valletta: Royal Opera House ruin (1) (1992)* - Wied tal-Ġnejna: il-Ġnien (1992) - Wied Gerżuma (1992)* - Wied il-Luq (1992) - Wied Qirda (1992).

GOZO - Dahlet Qorrot (2-1993)* - San Blas, Rdum il-Kbir area (1993) - Wied tal-Lunzjata, Fontana (including l-Ġhajn il-Kbira), Wied tax-Xlendi / Wied ta' l-Ilma valley sytem (29-7-1994)* - Wied ir-Riħan (24-4-2003).

Was increasing until the 1990's, maybe due it being a nitrophilic species. Now seems to be diminishing, due to intensive modification of valleybeds by agricultural development.

84. *Plantago bellardi* Allioni (P.1)

MALTA - l-Aħrax tal-Mellieħa area: il-Madonna ta' l-Aħrax (19-4-2008); tax-Xilep, Rdum il-Ġriewi (7-6-2008).

Family: *Asteraceae*

85. *Anacylus tomentosus* (Allioni) DC.

MALTA - h'Attard area: ta' Ċampira, ta' Irmiedi (fields between Wied il-Ħemsija, Wied ta' Ċampira, Wied ta' l-Irmiedi valley system and Triq l-Imdina highway) (17-5-2008) - ta' Qali national park (17-5-2008) - San Pawl il-Baħar area: in a *Eucalyptus* grove outside is-Simar nature reserve (2004); Telgħet ix-Xemxija (22-5-2008).

May not be indigenous. Found in open grassy places that have been subject to much leveling by human development.

86. *Anthemis arvensis* L.

MALTA - Laroka plateau (overlooking il-Buskett) (early 1990's) - Pieta pinetum (c.2003) - Wied Qirda (late 1990's) - Wied iż-Żurrieq area: along a pathway between il-Wied tal-Majla and ix-Xagħra ta' Smith / ix-Xagħra ta' Ras il-Bajjada (2005).

Past literature records this species as " Malta e Gozo, commune ! "(Sommier & Caruana Gatto 1915) " common "(Haslam et al. 1977) and was still frequent until the 1960's (E. Lanfranco pers.com.). Seems to have declined dramatically.

87. *Atractylis cancellata* L. (P.1)

MALTA - tal-Malaċin / ta' Pijru, ta' Żejsi (humps of rock on the outskirts of il-Mosta, along Triq Xifer il-Kief) (13-4-2002) - il-Mellieħa area: between il-Mizieb and Wied tal-Kalkara (6-3-2001) - Wied il-Għasel area: between il-Knisja tal-Għar and turning point to Misraħ Ghonoq (4-2002).

88. *Carlina lanata* L.

MALTA - Marfa peninsula: Ras il-Qammieħ (25-5-2008) - clay slopes overlooking ir-Ramla ta' Ghajn Tuffieħa, including il-Qarraba (7-2002) - Ras il-Pellegrin (7-4-2008) - it-Taflija (overlooking ir-Ramla tal-Mellieħa) (13-6-2003) - Wied Bufula (c.2000).

This species is recorded in past literature as " common " (Haslam et al. 1977) and was still frequent until the 1970's (E. Lanfranco & M. Briffa pers.com). Seems to have declined dramatically. Partial to clay soils.

89. *Catananche lutea* L. (P.1)

MALTA - ta' Glidi (between Haġar Qim, l-Imnajdra temples and it-Torri tal-Ħamrija) (14-2-2008) - l-Aħrax tal-Mellieħa area: il-Qatġha ta' Pleġġ (12-3-2008).

90. *Crupina crupinastrum* (Moris) Visiani

MALTA - l-Argentier (plateau overlooking il-Ballut tal-Wardija and San Martin) (22-5-2008) - il-Manikata area: ix-Xaġhra l-Ħamra (13-7-2007) - il-Mellieħa area: Ġnien Inġraw; Ghajn Żejtuna (21-1-2008); l-Imġiebah (6-2002); karstlands around il-Prajjiet / Popeye Village (2002); rocky terraces along it-Telġha ta' Selmun (c. 2000); around it-Torri l-Aħmar (13-6-2003); Wied Hanzira (2002) - il-Mizieb ridge: karstland stretches between il-Mizieb woodland and il-Manikata, including ix-Xaġhra ta' Rassa (22-3-2003); between ix-Xemxija heights and il-Mizieb woodland (26-4-2005); around Xemxija Civil Protection Unit enclosure (22-4-2005) - Pembroke (22-6-2003) - ta' Pijru, ta' Żejsi / tal-Malaċin (humps of rock on the outskirts of il-Mosta, along Triq Xifer il-Kief) (13-4-2002) - Wied id-Dis (5-4-2000) - karstland stretches between Wied Rini and Pupiruwa (10-4-2002) - Wied Mejxu (1995) - ix-Xaġhra tat-Tombu (near l-Imselliet school) (13-4-2002) - iż-Żebbieġħ (13-4-2002).

GOZO - ix-Xewkija area: ix-Xaġhra tal-Kus (4-5-2003).

Frequent among garrigue and steppic vegetation in the Northern half of the island of Malta; virtually absent elsewhere.

91. *Geropogon hybridus* (L.) Schultz Bip.

MALTA - il-Mellieħa area : around it-Torri l-Aħmar (31-8-2004), across to Triq Ghajn Tuta and ta' Wied Musa (2-9-2004) - il-Qolla (overlooking Wied il-Qlieġħa / Chadwick Lakes) (14-3-2003) - Ghajn Tuffieħa area: il-Wied tal-Ġinna, it-Tafal area (7-2002); clay slopes overlooking ir-Ramla ta' Ghajn Tuffieħa, including il-Qarraba (late 1990's) - between is-Salina and Ġhallis tower (c.2000) - Selmun clays (late 1990's) - Wied tal-Ġnejna / Wied taċ-Ċerċura (late 1990's) - Wied tal-Ħalqun, Wied ta' Fomm ir-Riħ valley system (1 unusually large specimen, over 0.75 m tall, was present) (7-4-2008) - Wied ta' l-Imselliet (13-4-2002).

92. *Hyoseris frutescens* Brullo & Pavone

MALTA - Dingli cliffs area: on a rock on which is built a rectangular *ħitan tas-sejjeħ* hut at il-Wardija (1995) - Marfa peninsula: coastal rock boulders below Ghajn Tuta (26-5-2008).

H. frutescens is common in Gozo; hence no Gozo records are given.

93. *Onopordum argolicum* Boissier (P.1)

MALTA - Dingli cliffs area: it-Turretta (9-6-2008).

94. *Podospermum resedifolium* (L.) DC.

MALTA - Ghajn Tuffieha area: il-Qarraba (2007) - Wied ta' Fomm ir-Riĥ (7-4-2008).

GOZO - id-Dabrani hill flanks (25-1-2005) - ta' Ġordan hill flanks (10-6-2008) - ta' Harrax hill flanks (25-1-2005) - ta' Leveċċa hillock (between iż-Żebbuġ and l-Għasri) (1996) - Marsalforn / ix-Xagħra area: il-Mielha, below Rdum ta' Kilulu (5-1994) - ix-Xagħra area: Taħt in-niċċa / ta' Fotier terraces (4-6-2008).

Frequent in Gozo; rare in Malta. Partial to clay soils.

95. *Scolymus grandiflorus* Desfontaines

MALTA - Wied Gerżuma (30-5-2008).

96. *Senecio pygmaeus* DC.

MALTA - Ghajn Tuffieha area: il-Qarraba (2007) - Marfa peninsula: among boulder screes between il-Minżel ta' Ruman / il-Minżel tar-Rixtellu and ta' Qassisu (vicinity of il-Qammieħ) (1-1993) - Qalet Marku (2-12-2000) - Rdum Majjiesa (5-2000).

GOZO - rocks facing il-Ġebbla tal-Halfa (27-1-2008) - ir-Ramla l-Hamra area: clays below l-Irdum tal-Marin (9-4-2008).

COMINO - l-Ghemieri peninsula (early 1990's).

Class: Liliopsida

Family: *Alismataceae*

97. *Alisma plantago-aquatica* L.

MALTA - il-Fiddien, Wied il-Qlejgħa valley system (1992) - Santa Luċija borehole reservoir (c. 2000) - in a pond along a downhill watercourse between tal-Virtu and Wied ta' l-Isqof (28-5-2008) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992) - Wied Ghajn Mula, Wied tal-Hzejjen, Wied ta' l-Imselliet valley system (13-4-2002) - Wied l-Isperanza (1993) - at meeting point between Wied il-Luq and Wied tal-Girgenti (1995) - Wied is-Sewda (1) (13-8-2007).

Family: *Hyacinthaceae*

98. *Bellevalia romana* (L.) Sweet

MALTA - il-Qolla, il-Qliegħa l-Kbira (overlooking Wied il-Qlejgħa / Chadwick lakes) (14-3-2003).

99. *Muscari neglectum* Gussone (**P.1**)

MALTA - Wied il-Għasel area: tal-Markiz (7) (11-3-2008).

100. *Scilla sicula* Tineo

MALTA - had-Dingli area: karstland between Misraħ Suffara and Hoffret ir-Rizz (18-3-2004) - between Għallis Tower and Coast road (late 1990's)* (*destroyed by road construction works*) - Għar Lapsi area: Wied ta' l-Ilsna, ix-Xagħra ta' Għar Lapsi (14-2-2008) - vicinity of Għar ta' San Brinkat (Wied Anġlu) (3-2000) - l-

Imġarr area: Wied il-Ħmar cliff-edge (5-2-2004); ta' Kalabardi (c.2000); ta' Mrejnu (5-4-2005) - Manoel Island (1991)* - il-Manikata area: ix-Xagħra l-Ħamra (c. 2000) - il-Mellieħa area: alongside Triq il-Qortin (14-3-2000); unbuilt plots alongside Triq il-Kbira (late 1990's); between il-Mizieb wood and Wied tal-Kalkara (6-3-2001) - vicinity of in-Nadur hill (17-3-2004) - Pembroke area: in a *Pinus halepensis* grove between St.Patrick's schools and Triq Sant' Andrija (c.2000) - Ras il-Pellegrin (7-4-2008) - frequent on screes and escarpments below the Victoria Lines Fortifications between Triq Burmarrad (il-Mosta) and Triq Xiġer il-Kieġ, including ix-Xagħra tal-Manakku, ix-Xagħra taċ-Ċejluwwa (2002) - vicinity of Wied il-Bassasa (3-2000) - Wied il-Għasel area: below ta' Barbamaru (South-facing valleyside just before road bridge); ta' Sunta l-Għawdxija? (rocks overlooking terraces at last valley turn before the quarry); between the quarry and it-Telgħa t'Alla u Ommu (1993) - Wied Għolliġa (1991) - Wied Harq Ħamiem (1995) - Wied il-Hesri (3-4-2003) - Wied ta' Seqła valleybed (l-Imselliet area) (13-4-2002) - Wied Żembaq (3-10-2003) - Wied iż-Żurriq area: tal-Markiz (2005) (*shown to the author by David Farrugia*) - ix-Xagħra tax-Xini (plateau facing il-Kunċizzjoni, overlooking Tas-Santi) (5-2-2004) - ix-Xemxija area: rocks alongside Triq il-Mistra (late 1990's)* (*destroyed by planting of Ficus nitida trees*).

GOZO - Wied l-Abjad (11-3-2003) (*also observed years previously by Darrin Stevens*) - Wied il-Għasri (9-11-2006).

Family: *Alliaceae*

101. *Allium amethystinum* Tausch

MALTA - Marfa peninsula: ta' Wied Musa, Wied Musa; around it-Torri l-Abjad; tat-Tunnara (1992) - il-Manikata area: ix-Xagħra l-Ħamra (13-7-2007) - Wied Rini (c.2000).

102. *Allium lojaconoi* Brullo, Lanfranco & Pavone

MALTA - l-Aħrax tal-Mellieħa: around it-Torri l-Abjad (7-6-2008) - Dingli cliffs area, including il-Wardija (late 1990's) - around Ġebel Ciantar quarries (2-6-2008) - l-Għallis (late 1990's) - Għajn Tuffieħa area: il-Qarraba (21-5-2008) - il-Hofra, il-Gwejdja (overlooking Wied Babu), Wied Babu (24-6-2003) - Marfa peninsula: Wied taċ-Ċirkewwa, il-Latnija, Ġebel Qammieħ, below il-Minzel ta' Ġaħa (25-5-2008) - il-Mellieħa area: around it-Torri l-Aħmar (13-6-2003) - Pembroke (22-6-2003) - is-Salib tal-Għolja area: l-Imsaqqa (2-6-2008).

GOZO - Ta' Ċenċ area: Fuq tal-Gruwa (7-2006) - coastline between l-Imġarr and Hondoq ir-Rummien (1-7-2003) - Wied il-Għasri (10-6-2008) - ix-Xagħra area: Rdum ta' Sekek, il-Firdien (4-6-2008).

Literature regarding this species has recorded it as a coastal rock plant (eg. Brullo, Lanfranco & Pavone 1982; Lanfranco 1989). However it is also found inland, as in the following localities, where it grows in abundance:

MALTA - l-Arġentier (plateau overlooking il-Ballut tal-Wardija and San Martin) (22-5-2008) - Clapham Junction cart ruts (2007) - il-Girgenti area: tal-Palazz (2-6-2008) - l-Imġarr area: ta' Mrejnu, ta' Kalabardi, across ix-Xagħra taż-Żingier to id-Daħar (10-8-2007) - Laroka plateau (overlooking il-Buskett) (4-8-2007) - in-Naxxar area: between it-Telgħa t'Alla u Ommu, il-Fortizza tal-Mosta and Wied il-Għasel quarry (15-6-2008) - Selmun area: il-Ħewlija, il-Ħewwiexa (near PaleoChristian tomb), Tal-Braġ (9-8-2007) - along Triq il-Buskett (9-6-2008) - Wied il-Hesri (20-8-2004).

103. *Allium nigrum* L.

MALTA - Ġnien il-Far (overlooking il-Buskett) (25-3-2008) - in screes below Victoria Lines fortifications alongside Triq Burmarrad, Mosta (late 1990's).

A. nigrum was recorded in the past as: “ **Malta**, commune. Specialmente dal lato Sud e Ovest dell’isola! **Gozo**, frequente! ”(Sommier & Caruana Gatto 1915); “ common ”(Haslam et al. 1977). Seems to have declined dramatically.

Family: *Iridaceae*

104. *Gynandriris aegyptia* (Delile) comb.nov.

MALTA - 1 clump along the road adjacent to Wied Harq Hamiem (13-3-2000).

105. *Iris sicula* Todaro (**P.1**)

GOZO - il-Munxar area: Wied tal-Ghawdxija (30-11-2007).

Family: *Dioscoreaceae*

106. *Tamus communis* L.

MALTA - Marfa peninsula: boulder screes below il-Minzel ta’ Ruman, il-Minzel ta’ Ġaħa, Rdum il-Qawwi, boulder screes below il-Minzel ta’ Pisswella (between iċ-Ċirkewwa and Ras il-Qammieħ) (1-1993) - il-Mellieħa area: in maquis under olive trees along a country lane branching from Triq Borġ Olivier (below Mellieħa parish church and cemetery) (c.2001); Ras il-Griebeġ (1993) - il-Mistra area: Tal-Blata (screes between Selmun and il-Mistra bay) (early 1990’s); screes between il-Mistra bay and Rdum Rxawm (12-3 -2003) - Ras il-Pellegrin (1993) - Rdum Majjiesa (5-2000) - among boulders below Victoria Lines crossing Wied id-Dis (1) (5-4-2000).

GOZO - Mgarr ix-Xini (12-1992) - boulder screes facing il-Ġebbla tal-Ħalfa island rock (26-2-1994) - Rdum il-Kbir (vicinity of San Blas) (1993) - iż-Żewwieqa (23-2-2008).

Family: *Juncaceae*

107. *Juncus acutus* L.

MALTA - il-Baħrija area: valleybed alongside tat-Tulliera (1992) - along watercourses on clay slopes overlooking il-Bajja ta’ Ġħajn Tuffieħa, including il-Qarraba (early 1990’s) - l-Imtahleb area: Rdum tas-Sarġ, Rdum tal-Vigarju (1995) - Marfa peninsula: in a temporary rock-pool on Ras il-Qammieħ plateau (1-1993); Wied Musa (vicinity of iċ-Ċirkewwa) (1992) - Marsascalea area: il-Maġħluq (early 1990’s) - il-Mellieħa area: Ġħadira nature reserve (1991); Ġħajn Żejtuna (early 1990’s) - il-Mistra bay (early 1990’s) - Paceville area: il-Qaliet (1992) - is-Salina (1992) - Rdum Majjiesa (5-2000) - Wied Gerżuma (5-2-2004) - at meeting point between Wied Ġħar Dalam and St. George’s bay (1) (3-10-2003) - Wied ta’ Kieli (vicinity of Qalet Marku) (29-4-1993).

GOZO - id-Dwejra area: alongside a watercourse between il-Qattara and il-Qawra / Inland Sea (1) (7-1993); along watercourses on a rock ledge at ta’ Spiteri (26-3-2003) - Ġħajn Ġħabdun (1) (21-10-2006) - Ġħajnsielem area: in a drainage outfall on the coastline below ta’ Briegħen (vicinity of Mgarr ix-Xini) (4) (12-1992) - l-Ġħarb area: Triq Santu Pietru (1) (early 1990’s) - Rdum tas-Surgu (clay slopes below il-Qortin plateau refuse dump) (5-1994).

108. *Juncus subulatus* Forsskal

MALTA - il-Baħrija area: ta’ Xafura (overlooking Fomm ir-Riħ) (1992) - il-Mellieħa area: Ġħadira nature reserve (1992); Ġħadira ż-Żħhira (1992) - clay slopes overlooking ir-Ramla ta’ Ġħajn Tuffieħa, including il-Qarraba (1992) - l-Imtahleb area: Wied ta’ Ġħar Ilma (early 1990’s) - Ras il-Pellegrin clay slopes (2-1993) -

is-Salina (1992) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992) - Wied Gerżuma (1992) - Wied Ġhajn Mula, Wied tal-Ħzejjen valley system, Wied ta' l-Imselliet valley system (13-4-2002) - Wied il-Halqun, Wied ta' Fomm ir-Rih valley system (*forms extensive valleybed meadows*) (7-4-2008) - Wied tal-Mistra (early 1990's).

Family: *Cyperaceae*

109. *Bolboschoenus maritimus* (L.) Palla (**P.1**)

MALTA - Wied tal-Ħzejjen (13-4-2002)

GOZO - Wied ta' San Blas (27-6-2008) - Wied Sara (10-1992).

110. *Carex distans* L.

MALTA - il-Fiddien (2002) - Marfa peninsula : Ġhajn Tuta (4-2007) - il-Mellieħa area: between Ras il-Griebeg and Ġhajn Żejtuna (14-3-2000); between Selmun and l-Imġiebaħ (1993) - Wied Gerżuma (30-5-2008) - Wied l-Ispanza (13-5-2008).

GOZO - on clay slopes below the South-facing side of Fort Chambray (late 1990's) - Rdum il-Kbir (23-4-2003).

111. *Carex divisa* Hudson

MALTA - Dingli cliffs area: il-Wardija, Rdum ta' Hurrieqa; Rdum ta' Għar Bittija (1995) - il-Fiddien, Wied il-Qlejġha (1992), il-Qlejġha l-Kbira (14-3-2003), Wied ta' l-Armla (31-5-2008) valley system - clay slopes overlooking ir-Ramla ta' Ġhajn Tuffieħa (1992) - l-Imtarfa area: it-Telġha ta' Slampa (early 1990's) - Marfa peninsula: Ras il-Qammieħ (25-5-2008) - ir-Rabat area: Ġhajn Qajjet (1992) - San Martin (22-5-2008) - along a downhill watercourse between tal-Virtu and Wied ta' l-Isqof (28-5-2008) - Wied tal-Ġnejna / Wied taċ-Ċerċura (1992) - Wied Gerżuma (1992) - Wied Ġhajn Mula (2002) - Wied tal-Halqun, Wied ta' Fomm ir-Rih valley system (7-4-2008) - Wied il-Ħesri (1992) - Wied l-Ispanza, Wied il-Għasel valley system (1993) - Wied il-Luq, also near il-Girgenti borehole (1992) - Wied tal-Mistra (early 1990's) - Wied ta' Seqła (vicinity of l-Imselliet) (13-4-2002) - Wied Gerżuma (1992).

GOZO - id-Dwejra area: Wied tal-Port; along watercourses on a rock ledge at ta' Spiteri (26-3-2003) - ta' Ġordan hill (9-11-2006) - Wied tal-Ġhajjun (between ix-Xagħra and in-Nuffara hill) (5-4-2006) - Wied il-Għasri, Wied ta' Sasin valley system (30-9-2000) - Wied il-Qlejġha (below iż-Żebbuġ hill) (11-3-2003) - Wied ta' Xhajma (5-4-2006).

112. *Carex hispidula* Willdenow

MALTA - il-Bahrija area: Wied il-Mielah (late 1990's) - Dingli cliffs area: Rdum Dikkiena; il-Wardija (1995) - il-Fawwara (1995) - l-Imtahleb area: Rdum tas-Sarġ (including Wied tal-Ħut, Wied ta' Ġordajna), Rdum tal-Vigarju, below tal-Milord, along a pathway leading to ta' Pajpurijiet, Wied ta' Għar Ilma (1992).

113. *Carex otrubae* Podpera

MALTA - il-Fiddien, Wied il-Qlejġha valley system (1992) - Ġnien iż-Żgħir (1992) - San Martin (7-1992) - is-Siġġiewi area: ta' Brija (3-4-2003) - Wied tal-Ġnejna (1992) - Wied il-Ħmar (vicinity of tas-Santi) (7-3-2008) - Wied l-Ispanza, Wied il-Għasel valley system (1993) - at meeting point between Wied il-Luq, Wied tal-Girgenti (1995) - Wied tal-Mistra (early 1990's) - Wied Qirda, Wied il-Kbir valley system (1992).

114. *Eleocharis palustris* (L.) Roemer & Schultz

MALTA - abundant at Wied tal-Ħzejjen (13-4-2002) (*never seen elsewhere*).

E. palustris was recorded in the past as: "**Malta, frequente...Gozo**" (Sommier & Caruana Gatto 1915); " *locally frequent* " (Haslam et al. 1977) and was still found along most watercourses until the 1960's (E.Lanfranco, pers. com. . Seems to have declined dramatically.

115. *Scirpoides holoschoenus* (L.) Sojak

MALTA - ħ' Attard area: Wied ta' l-Irmiedi (1992) (*Population much reduced by valleybed bulldozing in 6-2008*) - il-Bahrija area: abundant in most parts including ta' Namura, tas-Sarena, tat-Tulliera, il-Qliegħi, Wied il-Mielah, ta' Ghambierda, also in rock-pools on rocky karstland along Triq is-Sajf ta' San Martin (8-1992) - Dingli cliffs area: Rdum ta' Għar Bittija; Rdum Dikkiena, Rdum ta' Ħurrieqa, il-Wardija (1995) - il-Fawwara (1995) - il-Fiddien, Wied il-Qlejgha valley system (1992) - Ghajn Tuffieħa area: il-Ġnien (1996); clay slopes overlooking ir-Ramla ta' Ghajn Tuffieħa (1992) - abundant throughout l-Imtahleb area (*possibly the largest population in the country*); all places including Rdum tal-Qaws (overlooking tal-Gagħwija) (1995), rocks overlooking Għar id-Dwieb (1992); Wied ta' Għar Ilma (early 1990's); Wied ta' Markozz, along roads leading to ta' Pajpurijiet and ta' Soklos, below tal-Milord, Wied tar-Rummien (1992); Rdum tas-Sargħ, Wied ta' Ġordajna, Wied tal-Hut, Rdum tal-Vigarju (1995) - l-Imtarfa area: it-Telgha ta' Slampa (early 1990's) - ir-Rabat area: Ghajn Qajjet (1992) - Rdum Depiro (1995) - Rdum Majjiesa (5-2000) - Wied tal-Ġnejna / Wied tač-Čerčura (1992) - Wied Gerżuma (1992) - Wied Ghajn Mula (2002) - Wied tal-Ħalqun, Wied ta' Fomm ir-Riħ valley system (7-4-2008) - Wied il-Ħesri (1992) - Wied il-Ħmar (vicinity of tas-Santi) (7-3-2008) - Wied ta' l-Imselliet (13-2002) - Wied l-Isperanza, Wied il-Għasel valley system (1993) - Wied tal-Mistra (early 1990's).

GOZO - il-Qala area: Wied tal-Margħa (1997); Wied is-Simar (25-4-2005) - Wied Biljun (8-7-2003) - ix-Xagħra area: tax-Xaqra (vicinity of Calypso's Cave) (12-2007).

116. *Schoenus nigricans* L.

MALTA - Marfa peninsula: is-Sur ta' l-Ahrax, l-Għar tal-Għasafar (*the largest extant population*) (1992); between l-Ahrax tar-Ramal and il-Wied tar-Ratal (1992); plateau overlooking is-Sur and l-Għar ta' Żamżam (1992); plateau overlooking ir-Ramla tač-Čirkewwa (1) (1-1993)*.

Family: *Poaceae*

117. *Anthoxanthum gracile* Bivona

MALTA - il-Buskett: Verdala (early 1990's) - San Ġwann area: at the turning point between Wied Ghomor and Wied il-Kbir / tal-Frančiz (22-3-2007) - Wied il-Ħesri (3-4-2003) - on rocky outcrops of fields alongside road to ix-Xagħra ta' Lawrenti (vicinity of il-Buskett) (3-2008).

118. *Arundo plinii* Turra

MALTA - il-Buskett: Verdala (early 1990's) - il-Fawwara (1995) - l-Fiddien, Wied il-Qlejgha valley system (3-2001) - abundant at il-Girgenti, Ghajn il-Kbira, Wied il-Fulija valley system (1992) - Ġnien il-Kbir (early 1990's) - San Martin (c.2000) - is-Siġġiewi area: ta' Kilpa (2005); Wied il-Ħesri (1992) - San Ġwann area: Triq San Ġwann tal-Għargħar (1991); Triq it-Tellerit (Wied Ghollieqa) (1991) - San Martin (2-2003) - Wied Qirda, Wied il-Kbir valley system (1992).

119. *Brachypodium sylvaticum* Beauvois

MALTA - Dingli cliffs area: il-Wardija (16-6-2008) - Ġnien Inġraw (c.2000) - Marfa peninsula: Ġhajn Tuta (4-2007) - Wied Gerżuma (30-5-2008) - Wied il-Ġhasel (13-5-2008) - Wied il-Ħesri (12-11-2006) - Wied il-Luq (c. 2000) - Wied Qirda (23-5-2008).

GOZO - id-Dwejra area: between Wied Sofar and il-Qattara (12-6-2008) - Wied ir-Riġan (24-4-2003) - Wied ta' San Blas (27-6-2008).

120. *Crypsis aculeata* (L.) Aiton

MALTA - l-Ġhallis area: l-Ġhadira s-Safra (1992) - Paceville area: il-Qaliet saltmarsh (in bare patches among *Juncus acutus* tussocks) (1992)* (last seen in 1996).

121. *Crypsis schoenoides* (L.) Lamarck

GOZO - id-Dwejra area: valleybed between il-Qattara and il-Qawra / Inland Sea (c.1000) (7-1993) (During a site visit in 2007, accompanied by Mr. Joe Sultana, only 4 stunted specimens were found. A photograph of one specimen appeared in the popular publication *Nature in Gozo*).

122. *Sphenopus divaricatus* (Gouan) Reichenbach

MALTA - Ġżira Yacht Marina Garden (c.2003) - Paceville area: il-Qaliet (1-4-1993) - embankments around perimeter of Salina salt pans (15-4-1993) - Sliema area: Qui-Si-Sana playing field (late 1990's)*; Wesġat Ġuże Tanti (c.2000)*.

Family: *Typhaceae*

123. *Typha domingensis* (Persoon) Steudel

MALTA - h'Attard: Wied ta' l-Irmiedi (17-5-2008) - in a pond on karstland overlooking Ballut tal-Wardija (early 1990's) - Blata l-Bajda: Triq Dun Ġ. Preca (early 1990's)* - Dingli cliffs area: Rdum Dikkiena (1995) - il-Fawwara (1995) - il-Fiddien (3-2001)* - il-Girgenti*, Ġhajn il-Kbira valley system (1992) - Ġhajn Riġana (1992), Wied Ġhajn Mula, Wied il-Ħzejjen valley system (13-4-2002) - Hoffret ir-Rizz area: il-Barriera ta' Paroli (18-3-2004) - il-Manikata area: il-Kamp (2000) - il-Marsa area: a watercourse intersected by Triq Aldo Moro (1992) - il-Mellieħa area: Ġhajn Żejtuna (1993); l-Imġieħa (22-1-1995) - Saint Andrews: an unbuilt plot downside from Triq Sant' Andrija (late 1990's) - San Pawl il-Baħar: alongside Ġnien Anton Buttigieg (early 1990's) - Santa Venera: at a flooded construction site along Triq l-Inkwina (16-5-2008) - in a pond along a downhill watercourse between tal-Virtu and Wied ta' l-Isqof (28-5-2008) - Wied Ġħar Dalam (3-10-2003) - Wied Ħarq Ħamiem (1995) - Wied Qannotta (c. 2000) - Wied il-Qlieħa (7-2-2001).

GOZO - id-Dwejra area: Wied tal-Port (26-3-2003) - l-Ġhadira ta' Sarraflu (5-4-2004) - Ġħajnsielem area: Taħt il-Belt (early 1990's) - abundant in recently excavated ponds and reservoirs between ix-Xaħħra and Wied tal-Ġħajjun (27-6-2008) - Wied Sara, Wied tal-Grazzja, Wied Marsalforn valley system (10-1992) - Wied ta' Xħajma (11-10-2006).

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ON THE OCCURRENCE OF *CALOPTERYX VIRGO MERIDIONALIS* (SELYS, 1873) (ODONATA: CALOPTERYGIDAE) IN THE MALTESE ISLANDS.

Arnold SCIBERRAS¹ and Michael SAMMUT

ABSTRACT

During the 1987-1988 period, a dead *Calopteryx* specimen was found in a rock pool at Marsascala. This was the first record of this genus in the Maltese Islands. In this paper, we discuss the possible causes behind such an occurrence and the methodology employed in the identification of the specimen as *Calopteryx virgo meridionalis*.

Keywords: *Calopteryx virgo meridionalis*, occurrence, Maltese Islands

INTRODUCTION

During the last 20 years, there has been a significant increase in the study of local Odonata populations. This has yielded several new Odonata records for the Maltese Islands. Past studies, including four works (Mclachlan, 1899; Cowley, 1940; Valletta, 1949, 1957) list eleven species of Odonata occurring in the Maltese Islands. More recent studies have added new species to the previous list. Two of these, *Orthetrum trinacria* and *Trithemis annulata*, seem to have established themselves and their population trends suggest that both are on the increase. The other two, *Aeshna mixta* and *Trithemis arteriosa*, are only represented by a single record (Ebejer *et al.*, 2008).

Of the sixteen species of Odonata previously recorded in the Maltese Islands, only one species belongs to the Zygoptera (damselflies), *Iscnura genei*. This species is endemic to Corsica, Sardinia, Sicily, Capraia, and Malta (Dijkstra & Lewington, 2006).

History and identification of the locally-recorded specimen

A new, species, *Calopteryx virgo meridionalis*, was recorded from a single dead specimen, which was found in 1987-1988 by one of the authors (MS). The same specimen was shown to the late Anthony Valletta, who mounted it and took some photos, before returning it to (MS). Unfortunately, Mr. Valletta passed away before he could confirm the identity of the species, and thus, the specimen remained untagged and un-named.

In 2005, (MS) showed (AS) the poorly-preserved specimen (ravaged by *Anthrenus* sp.) for further examination. Initially, there seemed to have been a divergence of opinions regarding the identity of the specimen. Whilst (MS) was of the impression that the specimen belonged to the species *Calopteryx virgo meridionalis*, (AS) identified the specimen as a male *Calopteryx haemorrhoidalis*. This was because the morphological features and colouration of the same specimen seemed to vary from those of typical *C. virgo meridionalis* specimens. The behavioral characteristics and geographical distribution of *Calopteryx haemorrhoidalis* also made it the more likely species to occur. It was

¹ 131 'Arnest', Arcade Str, Paola – bioislets@gmail.com (corresponding author)

thus decided to consult Bernd Kunz, an Odonata expert. Measurements and photos of the specimen were sent for further study. He in turn confirmed that the specimen in question was in fact a male *C. virgo meridionalis*.

Calopteryx virgo is the largest European *Calopteryx* species. The wing ratio distinguishes this species from *Calopteryx virgo haemorrhoidalis*. This wing ratio is calculated by comparing the width and length of the wing. The wing ratio for *C. virgo* is 1:2.7 whereas in other similar species it is 1:3.3. This exercise was carried out by Mr Kunz and also (repeatedly) by the authors on twelve photo specimens of both *C. haemorrhoidalis* and *C. virgo*, along with a number of specimens collected abroad.

Three main forms of *C. virgo* can be distinguished on the basis of the wing pigmentation patterns, and are normally treated as subspecies (Dijkstra & Lewington, 2006). These are *C. virgo virgo*, *C. virgo meridionalis* and *C. virgo festiva*. *C. virgo meridionalis* is distinguished from *C. virgo festiva*, which occurs in Albania, Greece and Turkey, by a much more well defined clear basal area of the wings.

Moreover, various intermediate forms exist. For instance, intermediates between *C. meridionalis* and *C. festiva* occur in Italy. Such areas are known as "hybrid" zones. Since the wings of the specimen collected from Malta are darker than those of a typical *C. virgo meridionalis* specimen, but have a basal area which is too clear for it to be identified as *C. virgo festiva*, it is suggested that the specimen found in Malta belongs to an intermediate form between these two species.

There seemed to be no other record of this species taken or seen locally. None of the authors have ever encountered in the field or in local collections any other specimen of *C. virgo meridionalis*, until October 2007, when (AS) came across two unconfirmed records from Gozo. The first came from an apiculturist from Żebbuġ in Gozo, who claimed to have spotted a dead specimen in a water reservoir in 1985, but had no tangible proof to substantiate his claim. The second record was from a viticulturist from Nadur, who claimed to have found a wing of a specimen in 1985, and another complete dead specimen in 1997. Both were collected but were consequently devoured by *Lepismatidae* sp. as they were not preserved properly. The 1985 specimen is still extant and it was confirmed by (AS) as being identical to the specimen collected in Marsascala.

CONCLUSION

The local record of *C. virgo meridionalis* must be treated as an exceptional one. This is because its biology and habitat requirements are not compatible with habitats found in the Maltese Islands. In fact, this species prefers cooler waters than other *Calopteryx* species. The specimen recorded in this study must have been introduced either through human-mediated transport (e.g. accidental introduction with plant shipments) or even through natural phenomena, such as strong wind drifts and storms. Another interesting observation is that all four specimens recorded locally for this species were found dead, and no live specimen for the same species has ever been recorded locally. This could be the direct result of the *C. virgo meridionalis* individuals having been introduced locally with strong winds, thus precluding the individuals' chances of survival, locally.

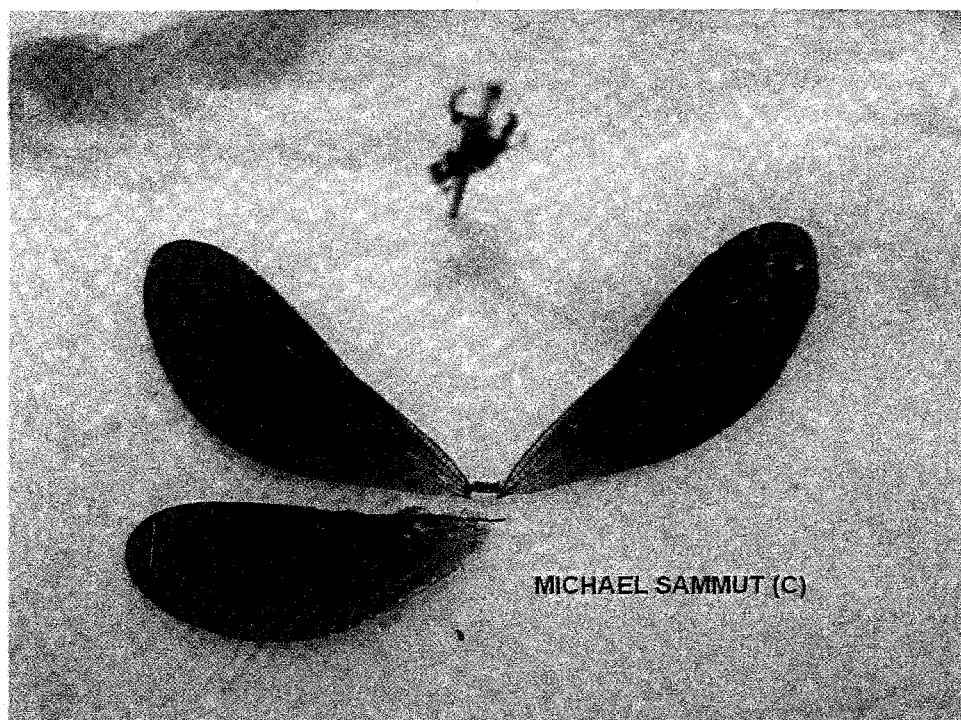


Figure 1: Flying appendages of *Calopteryx virgo meridionalis* specimen, recorded in 1985 (photo credits: Michael Sammut).

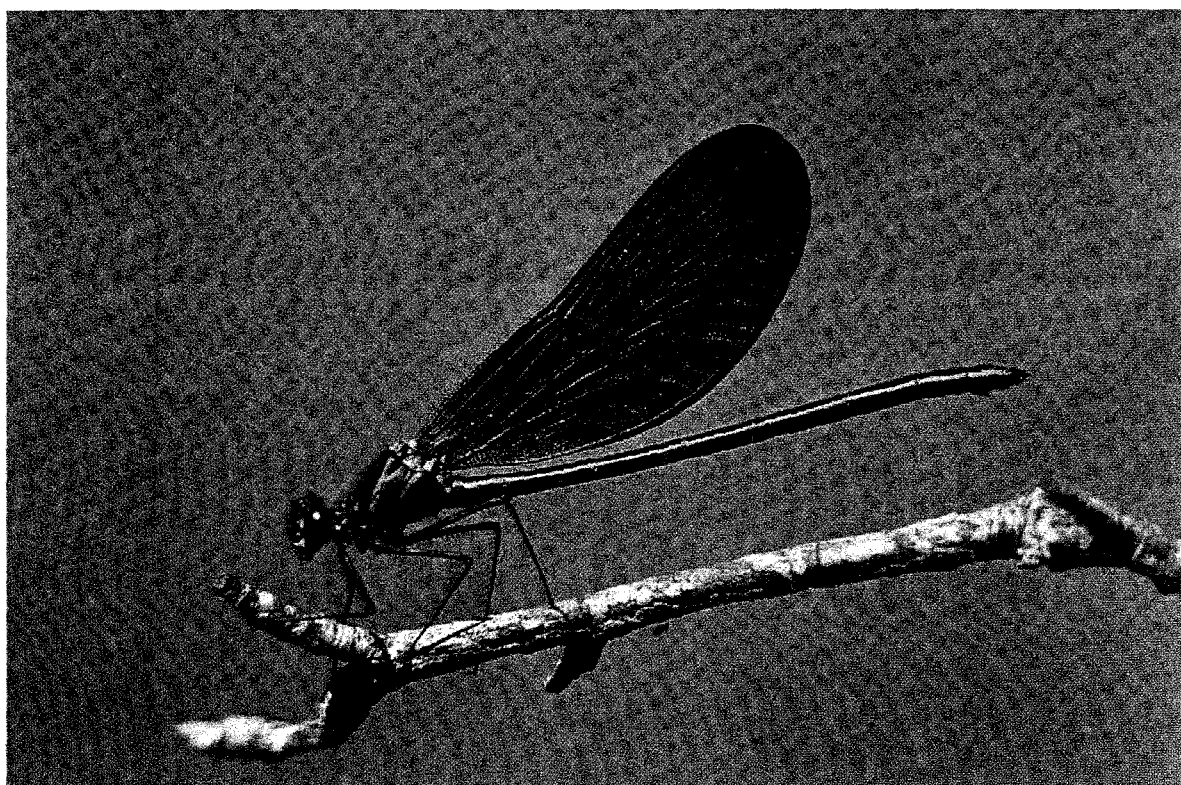


Figure 2: Male *Calopteryx virgo meridionalis* Selys, 1873 (photo credits: Bernd Kuntz).

ACKNOWLEDGEMENTS

The authors are indebted to Bernd Kunz, Langenburg, Germany who confirmed the identification of the specimen and provided the image of a live specimen. Furthermore AS wishes to thank Dr Florian Weihrauch and Godwin Degabriele for their useful comments. The authors also thank Esther Schembri and Jeffrey Sciberras for continuous assistance in field visits and Dr. Alan Deidun for extensively proof-reading the manuscript. Special thanks go to the late Anthony Valletta who encouraged one of the authors' passion for natural history, and Anthony and Carmen Sammut who were involved in the collection of the specimen.

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***ELYTRIGIA REPENS* (L.) DESVAUX EX NEVSKI (FAM. POACEAE), A NEW RECORD FOR THE MALTESE ISLANDS**

Timothy J. TABONE¹

ABSTRACT

The discovery of an indigenous population of *Elytrigia repens* extending for 420m through the valleybed of Wied il-Ghasri, Gozo, is reported. The accompanying vegetation is described. The species' distributional range and local status are also given.

Keywords: *Elytrigia repens*, Wied il-Ghasri, Gozo, valleybed, watercourse flora, ruderals, endangered species.

On the 30th September 2000, the author discovered a population of *Elytrigia repens* (L.) Desvaux ex Nevski (= *Agropyron repens* (L.) Beauvois; *Elymus repens* (L.) Gould in the valleybed of Wied il-Ghasri, Gozo. The valley bed in question consists of Globigerina limestone (early Miocene), at an altitude of approximately 45 - 55m, and harbours a semi-permanent watercourse resulting from rainwater run-off from the surrounding hills clay strata. The *Elytrigia repens* population extends intermittently for approximately 420m, starting a short distance from behind the il-Madonna tal-Patročinja Basilica. It is the dominant species in many watercourse stretches, mainly in the last 150m, subdominant with *Schedonorus arundinaceus* (Schreber) Dumortier in some stretches, and absent in parts overrun with ruderals, where the dominant species are: *Atriplex prostrata* DC., *Rumex cristatus* DC., *Oxalis pes-caprae* L., *Tropaeolum majus* L., *Foeniculum vulgare* L., *Aster squamatus* (Sprengel) Hieronymus, *Galactites tomentosa* Moench, *Paspalum paspaloides* (Michxaud) Scribner, *Arisarum vulgare* Targioni-Tozzetti and *Arum italicum* Miller. Although only one specimen of *Persicaria lanigera* (R. Brown) Sojak was found on the date of discovery (see above), during a site visit on the 9th November 2006, the species was found to have multiplied as to dominate a stretch of 15m. Other important accompanying species are the typical watercourse species: *Nasturtium officinale* R. Brown (only in flooded patches during late spring), *Trifolium fragiferum* L., *Carex divisa* Hudson, *Carex pairaei* F. Schultz, *Polypogon monspeliensis* (L.) Desfontaines; the ruderals: *Spergularia bocconeii* (Scheele) Graebner, *Sinapis alba* L., *Borago officinalis* L., *Verbena officinalis* L., *Dittrichia viscosa* (L.) Greuter. Also present were: *Parietaria judaica* L., *Polygonum aviculare* L., *Diploaxis erucoides* (L.) DC., *Sinapis arvensis* L., *Anagallis arvensis* L., *Lavatera cretica* L., *Geranium molle* L., *Apium nodiflorum* (L.) Lagasca, *Galium aparine* L., *Centaurium pulchellum* (Swartz) Druce, *Mentha pulegium* L., *Solanum nigrum* L., *Veronica anagallis-aquatica* L., *Plantago lagopus* L., *Calendula arvensis* L., *Glebionis coronaria* (L.) Tzvelev, *Limbarda crithmoides* (L.) Dumortier, *Sonchus oleraceus* L., *Bromus hordaceus* L., *Cynodon dactylon* (L.) Persoon, *Piptatherum miliaceum* (L.) Cosson, *Polypogon viride* (Gouan) Breistroffer and *Setaria adhaerens* (Forsskal) Chiovenda.

Elytrigia repens is circumboreal, occurring in Europe, temperate Asia, Siberia, Iraq, Iran, Afghanistan and North Africa; introduced to North America (Maire 1955; Sherif & Siddiqi 1988; Pignatti 1997; USDA online). Thus the Maltese Islands are well within the species' distributional range. The extensiveness and fragmentary character of the Gozo population is indicative of a dwindling long-established colony. These two factors, coupled with the occurrence in a non-anthropogenic habitat, indicate that the newly discovered population is indigenous. The

¹ Address: P.O.BOX 605, VALLETTA VLT1000; Email: Timothy.Tabone@gmail.com

subspecies occurring has not yet been ascertained. A specimen has been deposited in the private herbarium of Mr. E. Lanfranco.

Elytrigia repens is endangered in the Maltese Islands, as Wied il-Ghasri is being severely degraded by eutrophication in the watercourse, debris dumping, bulldozing and the cultivation of exotic trees, resulting in the indigenous watercourse flora being usurped by nitrophilic weeds. For example, no typical watercourse flora occurs in the initial 105m, the valleybed being dominated by cultivated *Ficus australis* Willdenow, *Eucalyptus* sp., *Arundo donax* L. and naturalised *Ricinus communis* L. Here, *E. repens* does not occur in the watercourse but along a 30m long stretch of well-shaded valleybed rocky pathway.

Other *Elytrigia* species recorded from the Maltese Islands are: *E. atherica* (Link) Kerguelen ex Carreras (very rare), *E. flaccidifolia* (Boissier & Heldreich) Holub (very rare) and *E. juncea* (L.) Nevski (infrequent).

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The author is indebted to his mentor, Mr. E. Lanfranco, for his generous assistance, particularly in providing access to rare bibliographical material present in his private library.

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REDISCOVERY OF *ORNITHOGALUM DIVERGENS* BOREAU (HYACINTHACEAE) IN MALTA

(SUPPLEMENT)

Sdravko Vesselinov LALOV¹, Alex CASHA², Edwin LANFRANCO³, Martin PSAILA⁴ and Timothy TABONE⁵

Due to a fortuitous omission, the last few references in the article "Rediscovery of *Ornithogalum divergens* Boreau (Hyacinthaceae) in Malta" (CMN, Volume 4 Part 3, pp 205-206) were not included. The same references are hereby included as a supplement:

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